

## 4.

Odonata (Dragonflies) of Kartabo, Bartica District, British Guiana.<sup>1</sup>

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(Plates I &amp; II).

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[This contribution is a result of various expeditions of the Department of Tropical Research of the New York Zoological Society, all made under the direction of Dr. William Beebe. The Guiana trips were made during the years 1909, 1916, 1917, 1919, 1920, 1922, 1924 and 1926. The Kartabo collections and observations were carried on in one-quarter of a square mile of jungle. For detailed ecological and meteorological notes see *Zoologica*, Vol. II, No. 7, 1919, pp. 205-227.]

## INTRODUCTION.

Dr. William Beebe has asked me to report on the Odonata taken at the New York Zoological Society's Tropical Research Laboratory at Kartabo, British Guiana. The collection contains many interesting forms which, in a number of instances, have prompted some excursions into their ecological relations. With Dr. Beebe's consent, I have included smaller lots, hitherto unreported, collected by Dr. Charles Hodge, IV, at Kartabo in July-August, 1926; by Mr. George B. Fox along the Essequibo River; and by the late Dr. William Schaus in French Guiana. The first two lots are in the Academy of Natural Sciences of Philadelphia, the third was sent to me for study some years ago, by the United States National Museum. The

<sup>1</sup> Contribution No. 797, Department of Tropical Research, New York Zoological Society.

types of the new species of Dr. Beebe's collection are deposited in the Academy of Natural Sciences of Philadelphia, as is also the type of one other species. The Odonate fauna of Guiana not represented in these four collections is not considered in this paper.

The only attempt<sup>2</sup> at a list of the Odonata of any of the Guianas known to me is that of W. F. Erichson of 1848, as a section of the Insect part of Richard Schomburgk's "Reisen in Britisch Guiana in den Jahren 1840-1844 im Auftrag Sr. Majestät des Königs von Preussen," Band III, pp. 583-586. Twenty-six species of Odonata are listed, without localities for any of them; fourteen of them are described, ten of the fourteen, including three credited to Hoffmann<sup>3</sup>, as new species. Seventeen species of Erichson's list are represented in the collections from Kartabo.

Taxonomic works before and after Erichson—Rambur, deSelys, Hagen, Kirby, Förster, the Williamsons, Montgomery, Borrer, Campion, Martin, Ris, Needham, Geijskes and the present writer—add many other species from the Guianas.

#### DISTRIBUTION OF THE KARTABO ODONATA.

The flora at the Kartabo laboratory is described as consisting of the typical rain forest of eastern South America with swampy areas and clearings made by Dutch and Indian planters.<sup>3</sup> It is of interest to compare the distribution of the Kartabo Odonata, throughout the entire geographic range of each species, with Messrs. Dillon and Smith's Generalized Phytogeographic Map of Latin America.<sup>4</sup> That map divides Latin America, from the northern boundary of Mexico to Cape Horn and including the West Indies, into 14 zones characterized by vegetation features. Kartabo and most of the Guianas lie in Zone 1, "tropical and subtropical rain forest," while a narrow band along the coast, in which Georgetown, Paramaribo and Cayenne lie, is part of Zone 7, "savanna regions."

In making the allocations which follow, it is not to be forgotten that the Odonata of large areas of South America are still unknown. The map employed is indeed generalized, in that its scale does not permit showing the microgeographic details so interpenetrating in a continent of such abrupt

changes in altitude (with all that they imply). Forest and clearings are frequented by different species of Odonata, and even the small area of study at the Kartabo laboratory, 2,000 by 4,000 ft. (650 × 1,300 m.), embraces at least these two kinds of habitat. It must be remembered, too, that the powers of flight of many Odonata are such as to enable them to pass easily from one sort of habitat to another; the correlation of the carnivorous Odonata with the flora must be indirect in most cases, through the intermediation of the phytophagous animals which in turn serve as food for the Odonates; and that more direct relations between dragonflies and plants exist where certain plants, such as bromeliads, serve the oviposition needs of certain Odonata (*Mecistogaster*).<sup>5</sup> The real index to Odonate distribution is not that of the winged adults but of the aquatic larvae and of the latter we are still almost entirely ignorant.

But with all these considerations, the results of allocating the Kartabo Odonata to the zones of Dillon and Smith's map are striking.

Of the 75 identified species here treated, none falls within zone 4 (palm forests), 5 (sub-antarctic heath forest), 9 (coastal desert of Pacific South America), 10 (Patagonian-Fuegian steppes) or 12 (transitional vegetation of central Chile).

In zone 11 (desert scrub) appears only the widespread *Orthemis ferruginea* (in Sonora), which occurs abundantly in zones 1-3, 6, 7 and 14.

In connection with each of the following lists of species (a-f), after indicating the plant zones of Messrs. Dillon & Smith (D.S.) in which they fall, it is pointed out how far these areas agree with the provinces of South American scorpions proposed by Dr. Mello-Leitão<sup>6</sup> (ML) and the districts of South American mammals proposed by Drs. Cabrera and Yapes<sup>7</sup> (CY).

<sup>5</sup> Another case, although not pertaining to the Guianan fauna, is that seen by E. B. Williamson at the Quebrada Sabaleticus, in Antioquia, Colombia, and thus described: "Here for the first time we saw *Cora* and observed its peculiar habit of ovipositing, which it shares with *Miocora*. The eggs are inserted in comparatively solid but barkless horizontal tree trunks or pieces of logs over water. In some cases the logs were scarcely damp, and the eggs were placed as high as six feet above the water." (*Misc. Publ. Mus. Zool. Univ. Mich.*, 3, 17, 1918.) Whether it is merely the physical condition of the logs which determines oviposition in them, irrespective of their kind, is not stated. Still more remote from the Guianan fauna is the case of the European *Aeshna viridis* which is believed by Wesenberg-Lund (*Internat. Revue Gesam. Hydrobiol. Hydrogr.*, 6:191, 389, 1913) and Münchberg (*Ztschr. Morph. Ökol. Tiere*, 20 (1): 181-183, 1930) to oviposit only in living plants of *Stratiotes aloides*. Münchberg states that *Anax parthenope*, in Grenzmark, eastern Prussia, oviposits in *Phragmites communis*, less often in *Scirpus lacustris*, never in dead plant tissue (SB. Ges. Naturf. Freunde, Berlin, 1932: 71).

<sup>6</sup> 1945. *Arquivos Mus. Nac. Rio de Janeiro*, 40:9-468, map fig. 185.

<sup>7</sup> 1940. *Historia Natural Ediar Mamíferos Sud-Americanos*. Compania Argentina de Editores, Buenos Aires, 4to, 370 pp. Map facing p. 14; reproduced as fig. 184 of Mello-Leitão above quoted.

<sup>2</sup> Whether Carl Peter Thunberg's "Fauna Surinamensis" Resp. Collin. 12 Dezbr. 1822. Upsaliae, Acad. Typogr. 4 p. 1-8" and "Fauna Cayenensis, Resp. Kjeller. 4. Juni 1823. Upsaliae, Palmblad. 4. p. 1-11," thus quoted in Horn u. Schlenkling's Index Litteraturae Entomologicae, Band IV, p. 1229 (1929), contain anything on Odonata, I do not know, as I have not seen them.

<sup>3</sup> Beebe, W., 1925; Beebe, W. & Gleason, H. A., 1925, The Guianas, in *Naturalist's Guide to the Americas*. Baltimore, Williams & Wilkins Co., pp. 654-655.

<sup>4</sup> Accompanying Smith, A. C. and Johnston, I. M., 1945. A Phytogeographic sketch of Latin America, Plants & Plant Science in Latin America, XVI, pp. 11-18. Chronica Botanica Co., Waltham, Mass.



Passing to Odonata of narrower geographic distribution, there are:

(a) Those at present known only from zone 1 (DS) (tropical and sub-tropical rain forest) of the Guianas and including in some cases the island of Trinidad. These are:

*Argia insipida*<sup>8</sup>  
*Leptagrion beebeanum*<sup>9</sup>  
*Leptagrion* sp.  
*Aeolagrion demerarum*  
*Acanthagrion adustum*  
*Metaleptobasis tetragena*<sup>9</sup>  
*Neonura joana*  
*Protoneura calverti*  
*Aphylla alia*<sup>9</sup>  
*Gomphoides fuliginosa*  
*Macrothemis pumila* (occurs also in zone 7, savannas at Georgetown)

It is quite likely that the apparently limited distribution of these species is due to scanty knowledge on our part.

Kartabo lies within the Carib province (ML) or the Amazonian district (CY). The Carib province roughly corresponds to the Savanna (Sabanico) district but its southern boundary is farther south and extends farther to the east.

(b) Species of the Guianas and the Amazon valley in zone 1 (DS) (tropical and sub-tropical rain forest).

*Hetaerina moribunda*  
*Microstigma maculatum*  
*Megapodagrion macropus*  
*Zonophora batesi*  
*Phyllocycla bartica*<sup>9</sup>  
*Fylgia amazonica*  
*Micrathyria spinifera*  
*Erythrodiplax angustipennis*  
*E. laurentia*

These species inhabit the Carib and Amazonian provinces (ML) or the Amazonian district (CY). The two maps of these authors are in agreement as to the southern and western boundaries of the Amazonian area.

(c) Species extending across much of the northern part of South America, but not farther north and not farther south than the Amazon valley.

*Hetaerina dominula*  
*Mecistogaster lucretia*  
*Phyllocycla signata*  
*Progomphus dorsopallidus*  
*Archaeogomphus hamatus*  
*Aeschnosoma peruviana*  
*Orthemis aequilibris*  
*Diastatops dimidiata*  
*Zenithoptera fasciata*  
*Oligoclada raineyi*

Five of these species are in our present

knowledge limited to zone 1 (DS), but *M. lucretia* and *P. dorsopallidus* occur also in zone 6 (thorn forest), *Z. fasciata* in 1 and 7 (savannas), *O. aequilibris* in 1, 6 and 7.

These species extend westward into the Incan (Incasica, Incasico) province (ML) or district (CY) which borders the Pacific coast of South America from Panama to Latitude 20° S.; such parts of zone 6 (DS) as they inhabit are along the Venezuelan coast of the Carib province (ML) or Savanna district (CY), while their area of zone 7 (DS) narrowly borders the Atlantic coast of the east end of the Carib and Amazonian provinces (ML) or of the Amazonian district (CY).

(d) Species which extend from the northern coast of South America and in some cases Trinidad (but not farther north) southward beyond the Amazon valley and falling in zones 1 and, mostly, in 7 (DS).

*Mecistogaster linearis* (not in 7)  
*Staurophlebia reticulata reticulata* (also in 6)  
*Gynacantha tenuis*  
*Diastatops pullata*  
*D. obscura* (also in 2, tropical deciduous forest)  
*Perithemis thais* (not in 7)  
*Oligoclada pachystigma*  
*Uracis oviposatrix*  
*U. infumata*  
*Erythrodiplax castanea* (also in 2 and 3, south Brazilian forest and savanna zone)  
*E. latimaculata* (also in 2 and 6)  
*E. maculosa* (perhaps also in 2)  
*E. melanorubra* (also in 2 and 6)  
*Rhodopygia cardinalis*  
*Macrothemis polyneura*  
*Idiataphe longipes longipes*

These species add to their distributional areas the Cariri province (ML) which is nearly equivalent to the Tropical district (CY). Some of them invade the Tupi and Guarani provinces (ML) which together correspond to the Tupi and Sub-tropical district (CY) although their respective boundaries in the two maps are different.

(e) Species which extend to the north of South America on the North American continent, to Central America, or to Mexico, or to the United States, but not into the West Indies. They reach in most cases southward below the Amazon valley; the numbers of the DS zones, in addition to zone 1, in which they occur, are added in parentheses.

- i. Not in zone 14 (montane)  
*Hetaerina caja* (2, 6, 7)  
*Megaloprepus caeruleus* (2)  
*Ceratura capreola* (3, 7)  
*Triacanthagyna ditzleri*  
*Gynacantha auricularis* (2, 7)  
*G. gracilis* (2)  
*G. membranalis* (2, 6)

<sup>8</sup> *Argia insipida* was recorded by Kirby from St. Vincent and Grenada in the West Indies (*Ann. Mag. Nat. Hist.*, (6) 14: 268, 1894); the identification should be confirmed.

<sup>9</sup> Species described as new in this paper.

*Orthemis biolleyi*  
*Uracis imbuta* (2, 7)  
*U. fastigiata* (7)  
*Microthyria eximia* (2, 3)

Some of these species extend southward into the Cariri, Tupi, Guarani and Pampean provinces (ML) or Tropical, Sub-tropical, Tupi and Pampean districts (CY).

ii. Also in zone 14

*Libellula herculea* (Cuenca) (2, 3, 7, 9?)  
*Orthemis cultriformis* (Chiriqui) (2, 8)  
*Erythrodiplax connata fusca* (Cuernavaca, Vilcanota; possibly Huanuco and Colonia del Perene, both in Peru, lie within zone 14)

The Montane zone (DS) includes the higher altitudes of the Incan, Pampean and Chilean provinces (ML) or of the Incan, Andine, Sub-andine and Chilean districts (CY).

(f) Species extending into the West Indies other than Trinidad and Tobago; these are mostly widespread in South America, Central America and Mexico, and some reach the United States; they all occur in zones 1 and 7, most of them also in 2, of the DS map. The numbers of the zones in addition to zones 1, 2 and 7 in which they occur, as well as the most southern geographical limit, are added in parentheses.

*Ceratura capreola* (3) (Rio Grande do Sul)

*Triacanthagyna septima* (6) (Rio de Janeiro)

*Gynacantha nervosa* (6) Porto Suarez, Bolivia)

*Coryphaeschna virens* (6) (Santa Cruz, Bolivia)

*Orthemis ferruginea* (3, 6, 11, 14) (Montevideo)

*Erythrodiplax unimaculata* (Paraguay)

*E. famula famula* (Minas Geraes)

*E. umbrata* (3, 6, 8, 14) (Buenos Aires)

*E. basalis basalis* (6) (Santa Cruz, Bolivia)

*Erythemis peruviana* (6) (Corrientes)

*E. attala* (3, 6, 8, 14) (Buenos Aires)

*Lepthemis vesiculosa* (3, 6, 14) (Corrientes)

*Dythemis multipunctata* (3, 6, 8) (Buenos Aires)

*Tholymis citrina* (6) (Minas Geraes)

*Pantala flavescens* (3, 6, 11, 14) (Sao Paulo)

*Tramea cophysa* (6, 8, 14) (Santos, Brazil)

(See also footnote 8 on *Argia insipida*, page 49).

It will be seen that these species reach southward into the Tupi, Guarani, Cariri and Pampean provinces (ML) or Tropical, Sub-tropical, Tupi and Pampean districts (CY).

#### ODONATA FROM KARTABO.

The species here treated are listed under two sets of relevant subfamily names, the

first that of de Selys and Hagen, dating from their *Revue des Odonates* of 1850 and widely used, the second that of the most recent classification of Tillyard and Fraser (*Australian Zoologist*, 9, 1938-40). Where one of the latter subfamilies is more than a subdivision of one of the former, that fact is indicated by marking it with a roman numeral. All these subfamily names are inserted for the convenience of the reader and do not necessarily imply acceptance of them by the present writer. For each species are given only those bibliographical references pertinent to the present text.

CALOPTERYGINAE S. & H., 1850 (as Calopterygines). HETAERININAE T. & F., 1939.

*Hetaerina dominula* Hagen, 1853.

(Plate I, figs. 3-6).

Selys & Hagen, 1854, *Monog. Calopt.*: 107, pl. 11, fig. 1 (Surinam).

Williamson, E. B., 1923, *Occas. Papers Mus. Zool. Univ. Mich.*, 130: 15, 19 (Brit. Guiana).

Geijskes, 1943, *Ann. Ent. Soc. Amer.*, 36 (2): 168, pl. II, figs. A-G (nymphs, Surinam).

Kartabo, 22.X.1920, one male, lacks abdominal segments 4-10; 1922, one female.

French Guiana, 60 m (iles) up Maroni River, 8.04, Wm. Schaus, U. S. Nat. Mus., one male.

The Maroni River male is of the same species as two males from Wismar, February 16, 1912, and two males from Tumatumari, February 11, 1912, all four from British Guiana, by L. A. and E. B. Williamson and B. J. Rainey and referred by Williamson (1923) to *dominula*. All five, however, differ from Selys and Hagen's figure of the superior appendages (1854) in having the proximal of the two divisions of the "dilatation" of the inner margin rounded, not acute, and from their description in the yellow of the sides of the thorax being well marked, including the stripe on the first lateral suture and the "terminale" stripe. The superior appendages, however, possess what their description of 1854 gives as a character distinguishing *dominula* from *caja*, viz.: "le bord interne supérieur offre, immédiatement après la dilatation, une petite dent analogue à celle de la *divina*."<sup>10</sup> The yellow lateral thoracic stripes are, however, narrower than the "bronze noirâtre" which separates them and hence differ in this respect from the description of *caja*.

On the other hand, the Wismar and Tumatumari males have the postoccipital tubercles angular and well marked, whereas

<sup>10</sup> On comparing pages 106, 112, 114 and 118 of the *Monographie des Caloptérygines* it would seem that in the original draft of the work it was the intention of the authors to recognize *divina* as a distinct species, but they did not do so and did not alter their original references to it.



Williamson says (p. 19) that in *dominula* they are low and rounded. The head of the Maroni River male is distorted and the tubercles can not be seen plainly. This apparent contradiction, as well as the condition of the inner dilatation of the superior appendages, caused me to ask Mrs. Leonora K. Gloyd to make comparisons with Williamson's specimens at the University of Michigan. She kindly replied as follows (February 22, 1943): "The situation seems to be this. Apparently Mr. Williamson (1923, p. 19) meant that the postoccipital tubercles of *dominula* appear low and rounded in comparison to those of *mortua*, as seen in the field without the aid of a microscope (*caja* was not taken in the same locality). I also looked up Hagen's figure of the superior appendages of *dominula* (cited above) and oriented one of E. B. Williamson's specimens so labeled until the appendages looked very much like Hagen's figure. The specimens Mr. Williamson sent you are of the same species as those at Ann Arbor, so there is no mistake in the labeling."

The Kartabo male lacks the appendages essential for determination. It has the postoccipital tubercles as in the Wismar and Tumatumari males, the yellow stripe absent from the first lateral thoracic suture, the yellow on the second lateral thoracic suture and on the metepimeron so reduced as to be much narrower than the intervening black, thus as originally described for *dominula*, but the (pale) reddish spot of the front wings does not reach the costa and is pale brown between costa and subcosta. The basal spot of the hind wings is pale brown, slightly tinged with red (hence this individual is probably not fully aged), its area corresponding fairly well with the original description.

An envelope containing two *Hetaerina* males from Bejuma, Carabobo, Venezuela, February 13, 1920, by J. H. and E. B. Williamson and W. H. Ditzler, sent to me by Mr. E. B. Williamson, was labeled *H. caja* but probably not in his handwriting. One of these in coloring, thoracic pattern and appendages is undoubtedly *caja*; the other is *caja* in coloring and thoracic markings, but its appendages are like those of *dominula* and are shown in our figure 3, Plate I.

The female from Kartabo is small (abdomen 33 mm., hind wing 22 mm.) and agrees with the description of that of *dominula* except that it has the genital valvules and the legs pale brownish-ochre instead of black; the postoccipital tubercles are as in the males described above.

Distribution of *dominula*: Guiana, "Brazil."

#### *Hetaerina moribunda* Hagen, 1853.

Selys & Hagen, 1854, Monog. Calopt., 134, pl. 12, fig. 4 (Para, Cayenne).

Sjöstedt, 1918, *Arkiv Zool.*, 11(15): 39 (Manaos, Brazil).

Geijskes, 1943, *Ann. Ent. Soc. Amer.*, 36 (2): 171 (supposed nymph, Surinam).

Kartabo, 6. VI. 1921, one male.

This male agrees with the appendages as described and figured for *moribunda* by Selys and Hagen (1854), but the wings differ in numbers of antenodals (33-34 on front wings, 31-37 on hind) and in the extent of the basal spots, as follows: on the front wings red from the costa to the hind margin but brownish in the costal cells to the level of the middle of the quadrilateral and in the subcostal cells to the separation of R and M; red ending six cells beyond the level of the quadrilateral. On the hind wings brownish-red from C to Cu (right) or slightly below Cu (left), extending in the costal cells to the 17th antenodal, in the subcostal cells to the 20th or 21st antenodal, and between M2 and Cu to the distal end of the quadrilateral.

The left hind wing is abnormal in the following respects as compared with the apparently normal right hind wing, whose features are noted in parentheses: total length 24.5 mm. (25.5), nodus farther from base 15 mm. (11) but nearer apex 10 mm. (15), maximum width beyond nodus greater 5.9 mm. (5.72), costal area beyond the nodus wider, many of the postnodals anastomosed, stigma smaller, irregular, M2 beginning three cells distad of nodus (at the sub-nodus), cell rows between R1 and M3 distad of nodus irregular.

I have before me for comparison a male from Wismar, British Guiana, January 31, 1912, taken by the late Messrs. L. A. and E. B. Williamson and Mr. B. J. Rainey, with typical *moribunda* appendages and numbers of antenodals (28 front wings) and postnodals (45 front wings), with the basal spot on the front wings nearly as in the Kartabo male except that in the subcostal space the brownish-red reaches beyond the point of separation of R and M to the same level as the red behind it, i.e., to the level of six cells distad of the distal end of the quadrilateral, while on the hind wings the red (less brownish than in the Kartabo male) reaches caudad to one row of cells below Cu and even to the hind margin from the wing base to eight cells distad therefrom, in the costal space to the 21st antenodal, in the subcostal space to the 23rd antenodal and between Rs and Cu to one or two cells beyond the quadrilateral. The hind wing is 25 mm. long.

On the other hand, two males respectively from Manaos, June 16, 1922, and Villa Murtinho, Matto Grosso, April 7, 1922, by J. H. Williamson and J. W. Strohm, with *moribunda* appendages, have the basal spots of the wings very nearly (Manaos) or smaller than (Villa Murtinho) as described for

the Hagenian types. Sjöstedt (1918) also has a note on a male from Manaos.

Distribution: Guiana, Amazon valley.

*Hetaerina* sp.

Kartabo, III. 9. 1926, one female, lacking head and abdominal segments 4-10.

This female has the hind wing 30 mm. long, antenodals on the front wings 24 (right), 23 (left), thoracic pattern similar to that figured by Ris<sup>11</sup> for *H. caja* female except that the dark green median thoracic stripe is wider anteriorly and the green upper metepisternal spot is connected with the green spot at the upper end of the second lateral suture; the middle and hind lobes of the prothorax are almost entirely metallic green and the hind margin of the hind lobe has some slight structural differences from that of *caja*.

Distribution of *H. caja*: Acapulco, Mexico, to Guayaquil, Ecuador, eastward to Trinidad, but not recorded from the Amazon valley or the Guianas.

AGRIONINAE S. & H., 1850 (as Agrionines).  
i. Pseudostigmatinae T. & F., 1938.

*Megaloprepus caerulatus caerulatus* (Drury, 1782).

*Megaloprepus caerulatus* Ris, 1918, *Archiv Naturges.*, 82, A (9); 64. Calvert, 1923, *Ent. News*, 34:129, 168.

Kartabo, Odon. 81, one female, abdomen 77 mm., right hind wing 67 mm., maximum width 17.5 mm., ratio length to width 3.82.

This female agrees better with the characters given by Ris (1918) for *M. c. caerulatus* than for *c. brevistigma*. He remarks: "Die Zahlenreihen ergeben dass eine scharfe Begrenzung von Formen nicht möglich ist. Immerhin ist eine relative Unterscheidung wenigstens der Form *brevistigma* in genügend bestimmter Form zu geben." In a study published five years later (1923) and based on fewer specimens, the present writer said: "An examination of his (Dr. Ris's) data on which these definitions are based clearly shows that one race grades into the other."

Distribution of *Megaloprepus caerulatus* as a whole: Vera Cruz, Mexico, to Demerara and to Yungaz, Bolivia.

*Microstigma maculatum* Hagen, 1860.

(Plate II, fig. 38).

Hagen in Selys, 1860, *Bull. Acad. Roy. Belg.*, (2) 10 (6): 17.

Selys, 1886, *Mem. Couron. Acad. Roy. Belg.*, 38 (4): 12.

Kartabo, 18. III. 1922; 30. III. 1926; V. 7. 1924; VI. 1. 1924; 28. VII. 1920; 8. VIII. 1920; five females, one male, also one male, "Odon. 130," head, left wings and

apex of right front wing lost. Most of these have lost the terminal abdominal segments.

Two species of this genus were at one time (1860), at least, reported from the Guianas by deSelys; they were stated to differ as follows (1860, but with the greater range of size given by him in 1886; italics as in de Selys, 1860):

	<i>M. anomalum</i> Rambur, 1842	<i>M. maculatum</i> Hagen, 1860
Size	medium, abd. ♂ 69-88 mm., ♀ 58-77; hind wing ♂ 47-72, ♀ 45-60	small, abd. 62-74 mm.; hind wing 48-55; sex not stated
Hind margin of prothorax	similar in the two sexes, rounded	much cleft ♂ (not described for ♀)
Wings	quite broad, <sup>12</sup> rounded	quite narrow <sup>12</sup>
♂ Front wings	terminal ninth (to twelfth, 1886) very finely reticulated, forming a dull yellowish, well circumscribed spot, oblique within (adult), yellowish-white (young); stigma slightly reddish (adult), yellowish-white (young), of 3-4 cells	apex very finely reticulated, not opaque or colored
Hind wings	stigma blackish-brown (adult), yellowish-white (young), of 3-4 cells	brown, of one cell only
♀ All wings, apex	narrowly and obliquely white or pale yellow	narrowly and obliquely milky (front) or slightly so (hind)
stigma	blackish-brown, of 3-4 cells, larger on front wings	yellow, of one to several cells (or absent, 1886)

All seven individuals from Kartabo approach the description of *maculatum* more closely than that of any other species. As few specimens of this species have been recorded or discussed in the scanty literature, the presence of these seven from one and the same locality renders it desirable to set down their range of variability in the characters which have been assumed as specific.

In all but one female (V. 7. 1924) the terminal portion of the abdomen is lost; in that female the abdomen measures 78 mm.

Hind margin of the prothorax in both males strongly cleft, in the females with a median, pointed (in profile view), shining,

<sup>11</sup> *Archiv Naturgesch.*, 82, A (9): 53, fig. 24, 1918.

<sup>12</sup> Width not stated numerically.



brown or black tubercle, narrowly yellow posteriorly.

♂. Front wings: denser reticulation at apex beginning .49-.82 mm. proximal to the stigma, denser between C and M1a than caudad, its proximal edge nearly straight, at right angles to C, its color faintly brownish-gray, its length 5.72 mm.; stigma .66-.74 mm., 2-celled, brown. Hind wings: 48-51 mm., denser reticulation at apex beginning at 4 cells proximal to, or .82 mm. distal to, the stigma, denser between C and R1 than caudad, its proximal edge nearly straight, at right angles to C, uncolored or faintly brownish, its length 1.88-5.32 mm. (in the male of 8.VIII.1920 asymmetrical in right and left wings); stigma .41-.74 mm. 1-celled or smaller, brown.

♀. Front wings: denser reticulation at apex beginning 2.2-4.25 mm. proximal to stigma, denser between C and M1a, or M2, or one row of cells posterior to M2, than caudad, its proximal edge convex, its color pale milky brown, faintly gray, faintly brownish-gray, faintly pink, or yellowish, its length 5.50-7.77 mm. (in some individuals asymmetrical in right and left wings); stigma .5-.9 mm. (asymmetrical in all individuals), 1-7-celled (frequently asymmetrical), pale gray to dark brown. Hind wings: 54-56 mm.; denser reticulation at apex beginning 1.5-3.93 mm. proximal to stigma (asymmetrical in four individuals), denser between C and M1a, or one row of cells posterior thereto, than caudad, its proximal edge convex (except in the left hind wing of ♀ V.7.1924 where it is slightly concave), its color pale milky brown or faintly gray, its length 5.3-7.0 mm. (asymmetrical in three individuals); stigma .5-.74 mm., slightly asymmetrical (markedly so in one individual), 1-celled (except 1 + in right wing of ♀ V.7.1924 and 2 + in right hind wing of ♀ 28.VII.1920), white to dark brown.

♂♀. All seven individuals have a yellow humeral stripe. A black, median, longitudinal, pectoral stripe is present in male 130, is present but interrupted in the other male and the female of 28.VII.1920, is very slight and linear in the female of 18.III.1922, is represented by a small blackish quadrilateral spot behind and between the third coxae in two females (V.7.1924 and VI.1.1924) and is absent in the remaining female.

On September 1, 1942, Prof. B. Elwood Montgomery kindly compared the Kartabo male of 8.VIII.1920 with Hagen's type of *maculatum* in the Museum of Comparative Zoology, Cambridge, Massachusetts, at my request. Of this type he wrote: "Under the side label *M. maculatum* in box, a male with following pin-labels: Essequibo Schmid, *M. obliquus* coll. Hagen, red type label Type 12123 and *Microstigma maculatum* Hagen. Tips of all wings somewhat frayed; left fore wing torn or shredded to base; speci-

men otherwise in good condition. Right fore wing is probably complete enough to check any details of venation. Pterostigma, front wing 1-celled, approximate size 1/3 mm.; same, hind wing, seems to fill only one-half cell, as in hind wing of Kartabo male, approximate size one-third mm. Venation at tip of wings more dense in the Essequibo (type) male; color of the tip, front wing, pale pink (due to color of veins as determined under microscope); both rear wing tips torn away. In the costal area of both wings there is a slight cloudiness bordering the cross veins giving the appearance of a slight cream color. Shape of the prothorax, especially its hind lobe, identical or very similar. Thorax of type is somewhat crushed, but markings appear to be identical, especially the yellow humeral stripe, except that it *may* not extend quite so far downward. Fore part of thorax is broken and covered with glue; dark mark on posterior (ventral) portion is same in shape (as in Kartabo male), but less dark in Essequibo male. Length of hind wing about 50 mm. estimated (tip broken off). The wings correspond in width to those of Kartabo male."

Prof. Montgomery also made a camera lucida drawing of a portion of tip of right front wing of the Essequibo male which is here reproduced (Fig. 38). The greater density of the reticulation, as compared with that of the Kartabo male is shown by the following figures:

	♂ Essequibo (type)	♂ Kartabo
Rows of cells between veins C and R	3	mostly 2
Rows of cells between veins R and M1	5-4	3-2-3
Rows of cells between veins M1 and M1a	5-3	3-2-3
Rows of cells between veins M1a and M2	2-3?	2-3

The material of *maculatum* cited in 1860 consisted of a male from Cayenne, a female from Santarem, a female (or a male) from Essequibo and a female from Surinam. In 1886, *maculatum* is quoted from Cayenne, Essequibo, Surinam and "un male de grande taille que je lui attribue est d'Obidos sur l'Amazone." The "patrie" of *anomalum* was given in 1860 as "Le Para, Santarem sur l'Amazone, Cayenne" (the last was the habitat given by Rambur for his *proximum* which de Selys placed as a synonym of *anomalum*); in 1886 as "Amazone (Para, Santarem) . . . exemplaires du haut Amazone (Masari, etc.)."

#### REFRACTIVE BODIES IN CERTAIN WING CELLS OF *Microstigma maculatum*.

In the original description of *Microstigma anomalum* Rambur wrote:<sup>13</sup> "alis hyalinis,

<sup>13</sup> Histoire Naturelle des Insectes Nevropteres, Paris, Roret, 1842, p. 289.

apice reticulatissimis nervis rufis, pterostigmate nullo vel subnullo ♂ . . . avec les nervures et nervules rougeâtres, portant ça et là petites globules très-fins (peut-être accidentels); très-finement réticulées à leur sommet antérieurement qui est blanchâtre sale ou un peu roussâtre . . ." No habitat was given for the single individual of this species.

I have not found any later references to these "petites globules très-fins" in the literature, so set forth the following data on their appearance as shown by the present seven specimens of *M. maculatum*.

Males: The cells of the apex of the front wings are smaller and more numerous than those of the hind wings. The faintly brownish-gray at the apex of the front wings is apparently due to almost colorless, finely granular, refractive bodies,  $\pm$  .013 mm. in diameter, without sharp outlines, located in the membrane of the wing of the cells between the costa and vein M1a. There may be as many as  $100 \pm$  of these bodies in a single cell. The cells in which these refractive bodies occur vary in their longest diameters from .2 to .635 mm. The cross veins separating these small cells are wider, e.g., .026 mm., than the cross veins (.017 mm.) which are both farther caudad and proximad. The refractive bodies may occupy the whole or only parts of the cells. Cells at the proximal edge of the gray area do not show a less density of the refractive bodies within them than exists in adjoining cells farther distad in the gray area. The refractive bodies are present in the four larger cells proximal to the first small cells between the costa and vein R1. The hind wings do not show these refractive bodies. The smallest cell observed in the hind wings has a long diameter of .14 mm. and, as in the smallest cell in the front wings mentioned above, is at the wing margin.

Females: Refractive bodies are present in the apical cells of both front and hind wings of all five females. In the front wings they are found in the cells from the costa to vein M2, or to one row, or to two rows, below M2, or to Rs. The smallest apical cell noted was .108 mm. in diameter. In the hind wings these bodies occur in apical cells between the costa and M1a, or M2, or one row of cells below M2. The smallest apical cell noted was .038 mm. in diameter, but the impression was that the cells in the apex of the front wings are on the whole smaller than those in the hind wing.

The following observations were made on the right hind wing of the female of 30.III.1926, under both a binocular Greenough microscope and a compound Leitz microscope. Immersion of the wing apex in 95% alcohol between a slide and cover slip for three hours produced no change in

the refractive bodies. A similar immersion in potassium hydrate (strength unknown) produced a sharply marked polygon, clearer than the refractive body itself, around each body. The wing apex was then transferred to a Syracuse watch glass of the same KOH solution in which it remained bathed for 14½ hours. Examination at the end of that period showed that some cells preserved the polygons as above noted, others were as at first examined in the dry condition, still others had many small air (?) bubbles within them. The wing apex was then washed in water and transferred, still wet, to a slide but without a cover slip; the three sorts of cells as stated for the KOH condition were still visible. The wing apex remained on the slide until it dried, when its appearance in all its cells was the same as that of the apex of a front wing of the same female which had been kept untreated in the dry condition.

At the suggestion of Dr. Rudolf G. Schmieder, the extreme tip of the wing apex which had been treated was cut off through some of the cells containing refractive bodies, mounted dry in a vertical position and the cut edge examined through Leitz objectives 3 and 6 to endeavor to determine whether the refractive bodies could be distinguished, possibly as thickenings of one or other of the two wing membranes. Clusters of granules, of the size seen in the refractive bodies in surface view of the wing apex, were observed here and there, apparently on the outer surface of one or another membrane. These were not found in a similarly mounted fragment of a part of the same wing not containing the refractive bodies. It would appear, therefore, that the outer surfaces of the wing apex, in the refractive body areas, are roughened here and there, and thicker at the site of each refractive body. The thickness of the combined two wing membranes where free from veins and refractive bodies was between .00145 and .00097 mm. in both the fragments examined. At a refractive body the wing section was .0029-.0058 mm. thick; at a cross vein .026-.058 mm. thick.

#### *Mecistogaster* Rambur, 1842.

Two species of this genus are represented in the present material from Kartabo. They may be distinguished from each other as follows:

The pale antehumeral and humeral stripes less unequal in length, their levels overlapping, the former 2.38-3.68 mm., the latter 3.68-4.09 mm. Pterostigma of the front wings longer (♂4.91-5.89, ♀4.91-5.32 mm. or not differentiated), of the hind wings shorter (♂4.91-5.73, ♀4.50 or not differentiated). Males with front margin of hind wing not produced forward before the apex; superior appendages in profile view not bent ventrad,



apex truncated obliquely caudad and ventrad. Females with a yellow spot on each side of hind end of abdominal segments 7-10 or some of them. Abdomen ♂100-125, ♀63-98, hind wing ♂49-60, ♀43-75 mm. (Dimensions according to de Selys 1886) . . .

*linearis*

The pale antehumeral and humeral stripes very unequal in length, the former less than 1 mm., the latter 3.27-4.58 mm., the former not reaching upward as far as the level of the lower (or anterior) end of the latter. Pterostigma of the front wing shorter (♂2.37-4.25 mm., ♀2.37-2.94 mm. or not differentiated), of the hind wing longer in the male (5.97-7.94 mm.) but shorter in the female (3.27-2.94 mm. or not differentiated). Males with front margin of hind wing gradually produced forward in an elliptical curve at the stigma; superior appendages in profile view bent obliquely ventrad beyond mid-length, apex slightly bifid. Females with no yellow spots on abdominal segments 7-10. Abdomen ♂120-130 (117-137), ♀85-110, hind wing ♂58-68, ♀55-70 (♂51-64, ♀49-60) mm. (Dimensions according to de Selys, 1886, but where the Kartabo examples exceed his ranges they are given enclosed in parentheses) . . . . . *lucetia*

*Mecistogaster linearis* (Fabricius, 1777).

*Agriion linearis* Fabricius, 1777,<sup>14</sup> Gen. Insect. :249 (nec Fabr. 1781, Species Insect., 1:528, Nö. 5; 1793, Ent. Syst., 2:388, No. 5). Campion, 1917, *Ann. & Mag. Nat. Hist.*, (8) 19:447.

*Mecistogaster linearis* Selys, 1860, *Bull. Acad. Belg.*, (2) 10 (6): 22; 1886, *Mem. Couron. Acad. Belg.*, 38 (4):23. Kirby, 1897, *Ann. & Mag. Nat. Hist.*, (6) 19:615. Ris, 1918, *Arch. Naturges.*, 82 (A9): 73. Sjöstedt, 1918, *Arkiv Zool.*, 11 (15):33. Munz, 1919, *Mem. Amer. Ent. Soc.*, 3:74, pl. 8, fig. 50 (venation, hind wing ♀). Needham, 1933, *Amer. Mus. Novit.*, 664:1. Fraser, 1946, *Trans. R. Ent. Soc. London*, 97 (18):462, figs. 3 c, d (wing tips ♂), 4 b, c (apps. ♂).

*Mecistogaster marchali* var. *selysia* Navas, 1923, *Mem. Pontif. acc. Rom. Nuovi Lincei*, (2) 6:9 (new synonym).

After considering the discussions by de Selys (1860) and Campion (1917) on the type of this species, it seems permissible to regard the Fabrician specimen in the Banks collection of the British Museum as the lectotype,<sup>15</sup> fixed by de Selys (1860) as the first reviser.

In 1860, de Selys distinguished different ages of imago of both sexes of this species.

<sup>14</sup> For 1777, instead of 1776, the usually quoted date of publication, see Hagen, *Biblioth. Ent.*

<sup>15</sup> For definitions of lectotype and references to pertinent literature, see Frizzell, 1933, *Amer. Midl. Nat.*, 14:655; Cresson, 1934, *Ent. News*, 45:124.

The number of specimens from any one locality, as reported in the literature earlier than Col. Fraser's paper of 1946, is smaller than of those present from Kartabo, five males, three females. The latter are listed, therefore, as follows to show both their age, following de Selys, and their seasonal distribution:

Young, front wings, tip white or pale yellow, including the yellowish stigma; hind wings as stated for front wings. Two males, "Odon. 87," 1917, and 22.XI.1920; two females, V.8.1924, and 19.VII.1920.

Semi-adult, front wings, tip whitish, stigma orange above and below; hind wings as stated for front wings. One female, "Odon. 82," 1921.

Adult, front wings, tip smoky or uncolored, stigma orange or ochreous above, dark brown beneath; hind wings, tip faintly smoky, stigma as stated for front wings; abdomen with some pruinosity on hind segments. Three males 3.IV.1924, 24.VII.1920, and 6.XI.1920.

The males have the pterostigma extending from C to M1, with one row of cells between C and R1 and one row between R1 and M1.

It is to the young imago of *M. linearis*, or of *M. lucetia*, or of both species, that the following observations, made by Dr. Beebe on the Aremu River, a right tributary of the Cuyuni, some 25 miles from Kartabo, in late March, 1909, probably refer. "At noon we stopped for breakfast in a primeval forest with rather thin underbrush. . . . Spinning through the aisles made by the giant columns of tree-trunks, were curious translucent pin-wheels, and not until we captured one in the butterfly net did we realize we were looking at the same attenuated forest dragon-flies (*Mecistogaster* sp.) which had deceived us so completely five years ago in Mexico.<sup>16</sup> The movement of the long, narrow wings, with the spot of white at the tip was, to the eye, a circular revolving whirl, with the needle-sized body trailing behind. The white spots revolved rapidly, while the rest of the wings became a mere gray haze. These weird creatures, apparently so ethereal and fragile, were hunting for spiders, and their method was regular and methodical. From under leaves or from the heart of widespread webs, good-sized spiders were snatched. A momentary juggling with the strong legs, a single nip and the spider minus its abdomen dropped to the mould, while the dragon-fly alighted and sucked the juices of its victim. If we drew near one of these spiders on its web, it instantly darted away, sliding down a silken cable to the ground or dashing into some crevice, but the approach of the hovering dragon-fly, although rather deliberate, was unheeded,

<sup>16</sup> Two Bird-lovers in Mexico, pp. 239-241.

the spider remaining quiet until snatched from its place."<sup>17</sup>

Geographical distribution of *M. linearis*: The Guianas, Amazon Valley from Para to the Rio Bobonaza in Ecuador, Muzo, etc., in the eastern Cordillera of Colombia; Venezuela; one male from Matto Grosso (Ris, 1918).

#### THE SEASONAL DISTRIBUTION OF *Mecistogaster linearis* THROUGHOUT ITS RANGE.

It will be noted that of the specimens from Kartabo dated for day and month, both young and adult have been collected in July and November; July in the long wet season, November at the end of the long dry season. The remaining two dated individuals are from April and May, at the end of the short dry and the beginning of the long wet season respectively.<sup>18</sup>

Among Schaus's material from French Guiana, in the U. S. National Museum, are two young females from Cayenne, December, 1903, and the Maroni River, June, respectively.

The records of occurrence at Kartabo and in French Guiana indicate that *linearis* imagoes are to be met there during much of the year and are not limited to any one season, but the data are not yet full enough to make more precise statements.

Kirby (1897) records *linearis* taken in forest at Santarem, lower Amazons, February 27, 1896, in the wet season. Sjöstedt (1918) has briefly described a semi-adult male, a young male and three young females from the Amazons (Rio Autaz, Sept.-Nov., Rio Purus, Jan., and Manaos, July). In the collection of the Academy of Natural Sciences of Philadelphia is a semi-adult male taken at Manaos X.18.1919. July to November represent the relatively dry season, January the height of the wet season.<sup>19</sup>

Ris (1918) has described very adult males and females from Muzo in October, 1910, a very adult male from Llanos de Medina in June, 1910, and an adult male and young and adult females taken at Villavicencio, in January, 1911, all in Colombia. Villavicencio,

at 450 meters elevation, lies at the entrance to the llanos (Ris, p. 3), where January falls in a dry period, June in the wet season.<sup>20</sup>

Navas (1923) has described females from Muzo of July and October, 1918, under the name *Mecistogaster marchali* var. *selysia*. His account of the membrane of the apex of apparently all the wings as "opalino sive lacte picta" seems to apply better to *M. linearis* than to *marchali* (= *lucretia* Selys, 1890).

Prof. Needham (1933) has recorded a male of *linearis* from Mt. Duida, Venezuela, November 23, 1928. If we may use the precipitation records of Ciudad Bolivar, this would be in the wet season (Reed, 1928, p. 10).

Quite recently (1946) Col. Fraser has published a list of *linearis* taken at localities in Colombia and Peru in the valleys of the Putumayo, Amazons and Huallaga rivers. His largest series of specimens (12♂, 27♀) is that from Mishuyacu, Peru, described as being "near Iquitos" (t. c. (2): 11); the males were taken from Feb. 2 to July 10, the females from Jan. 25 to Dec. 20, except, apparently, Sept. and Oct., all in 1931; one male, Oct. 31, is cited from Yumbatos, Peru, in the Huallaga valley. Brooks says:<sup>21</sup> "On the Amazon side of the Andes the rainy season last[s] from October to April, and the dry season from May to Sept. but July is the only really dry month." The seasonal range of the Mishuyacu *linearis* extends through a wet season with two maxima, March and December, and a dry with a minimum rainfall of 4.6 inches in August, if we may use the Iquitos data.

In these extra-Guianan records of *linearis*, the wet season is represented by those from Santarem, Rio Purus, Llanos de Medina, Muzo, Mishuyacu and Mt. Duida, the dry from Villavicencio and relatively dry from Manaos, the Rio Autaz, Muzo and Mishuyacu.

#### *Mecistogaster lucretia* (Drury, 1773).

*Libellula lucretia* Drury, 1773, Illustr. Nat. Hist., 2:87, pl. 48, fig. 1, Index p. 2. Sulzer, 1776, Abgekürzt. Gesch. Insec. 1: 169, tab. 24, fig. 4.

*Lestes lucretia* Westwood, Drury, 1837, Illustr. Nat. Hist., 2: tab. 48, fig. 1.

*Agrion lucretia* Burmeister, 1839, Handb. Ent., 2:818.

*Mecistogaster lucretia* Rambur, 1842, Ins. Nevrop.: 286. Kirby, 1890, Cat. Odon., 121

<sup>17</sup> M. B. & C. W. Beebe: Our Search for a Wilderness, New York, Henry Holt & Co., 1910, pp. 270-1. Spiders form at least part of the food of *Megaloprepus caerulatus*, ally of *Mecistogaster*, listed on page 52 ante; Calvert, Ent. News, 34:171-4, 1923.

<sup>18</sup> Climatic data from Beebe, British Guiana in the Naturalist's Guide to the Americas: 649-652 (Baltimore, The Williams & Wilkins Co.), 1926; Reed, Monthly Weather Review, Suppl. 31:8, 1928; Miller, Climatology, London, Methuen, 1931, pp. 75, 88-89. Haurwitz & Austin, Climatology, New York & London, McGraw-Hill, 1944, p. 234. "There is considerable variation in these seasons, and occasionally a short season is almost eclipsed." (Beebe).

<sup>19</sup> See data by Reed (1931) for Taperinha, near Santarem, and for Manaos, in Yearbook U. S. Dept. Agric., 1941, pp. 674, 675. White, O. E., The Amazon Valley in the Naturalist's Guide to the Americas, p. 675, 1926. Kendrew, W. G., Climates of the Continents, 2nd edit. (Oxford, Clarendon Press, 1927), pp. 325-6, 343. Brooks, C. E. P., Climate (New York, Scribners, no date, subsequent to 1928), pp. 142, 144. Miller, A. A., Climatology, p. 89. Haurwitz & Austin, Climatology, 234, 1944.

<sup>20</sup> Kendrew, p. 323. Reed, p. 12, data for Puerto Berrio, nearest station to Muzo. Muzo lies in one of the north to south interandine valleys where in July there is less, in October more, rain. Haurwitz & Austin, p. 235 (Bogota, Medellin). "From the llanos there are no long series of records, but all accounts tell of an almost rainless period from the end of November till the middle of March." (Kendrew, p. 323.)

<sup>21</sup> Climate, p. 167. Precipitation figures for each month at Iquitos are given by Reed, p. 17; Kendrew, p. 343; Miller, p. 89.



(in part). Selys, 1890, *Compt-Rend. Soc. Ent. Belg.*, pp. cxix, clxiv. Fraser, 1946, *Trans. R. Ent. Soc. Lond.*, 91(18):452, fig. 3b (tip of hind wing ♂).

*Preia lucretia* Gistel in Gistel & Bromme, 1850, *Handb. Naturges.*, 452. Cowley, 1934, *Entom.*, 67:202.

*Agrion linearis* Fabricius, 1781, *Spec. Ins.*, 1:528, No. 5; 1793, *Ent. Syst.*, 2:388. (Nec Fabr., 1777, *Gen. Ins.*, 249).

*Libellula linearis* Gmelin, 1790, *Syst. Nat.*, 1(5):2625, No. 45. Olivier, 1792, *Encyc. Meth. Ins.*, 4:567, No. 41 (in part).

*Libellula longissima* Fée, 1832, *Vie de Linné*, 365.

*Mecistogaster marchali* Rambur, 1842, *Ins. Nevrop.*, 283. Selys, 1860, *Bull. Acad. Roy. Belg.*, (2) 10 (6):25; 1886, *Mem. Couron. Acad. Roy. Belg.*, 38 (4):25. Kirby, 1890, *Cat. Odon.*, 121.

*Mecistogaster filum* & *pedicellatus* Rambur, 1842, *Ins. Nevrop.*, 284.

The changes made by de Selys in 1890 in the nomenclature of *M. lucretia* and *marchali* were subsequent to the publication of Kirby's Catalogue. The revised synonymy of what he earlier called *lucretia* Drury, later *amalia* Burmeister, is given in *Biologia Centrali-Americana*, Neuroptera, 354, 1907, and to it I now add a new synonym, *Agrion linearis* Blanchard (1840, *Hist. Nat. Ins.*, 3:64, *Nevrop.* pl. 2, fig. 1.). The revised synonymy and references for de Selys' earlier *marchali*, later *lucretia*, have not been detailed and therefore are given above, after an examination of all the passages quoted. Dr. Ris (1913, *Mem. Soc. Ent. Belg.*, 22:59) has retained the Selysian nomenclature of 1860 and 1886 for *lucretia* and apparently cites only the second reference to *lucretia* by de Selys in 1890, i.e., p. clxiv, quoting McLachlan's opinion, and overlooking the first reference, p. cxix, with the original suggestion by Hagen. I see no reason to change my arrangement in the *Biologia* just quoted and which Dr. Ris doubted.

In 1860, page 20, de Selys distinguished young and adult imago of this species, under the name of *M. marchali*. As in the case of *M. linearis*, the material present from Kartabo is more extensive than that hitherto recorded in the literature from any one locality. It and two males from nearby Rockstone are, therefore, listed here to show the age and the seasonal distribution.

Young, abdomen not pruinose; front wings, tips whitish or pale yellow, including the stigma; hind wings, tips uncolored except the pale brown stigma. Three males, 5.VIII.1920, 17.VIII.1920, and "Odon. 122;" two females, 1.III.1920, 6.XI.1920.

Semi-adult, abdomen not pruinose; front wings, tip slightly smoky, stigma yellow or ochre; hind wings, tip uncolored, stigma

darker brown. One male, 23.VIII.1920; two females, 16.VIII.1920, and no date. Rockstone (Schaus) one male, no date.

Adult, abdomen with some pruinosity on hind segments; front wings, tips slightly smoky, stigma reddish-brown or darker brown; hind wings, tips uncolored, stigma dark brown. Four males, 13.III (no year), 5.VIII.1920, 18.VIII. (no year), 20.XI.1920. Rockstone (Williamson & Rainey) one male, Feb. 12, 1912.

The males here listed have the pterostigma extending from C to M1 (or to a fraction of a cell below M1 on the front wings); on the front wings it consists of two rows of cells between C and R1 and one or two rows between R1 and M1; on the hind wings it consists of only one row of cells between C and R1 and one row between R1 and M1.

Geographical distribution of *M. lucretia*: Northern Venezuela, the Guianas and the lower and middle Amazon valley (Selys, 1886).

#### THE SEASONAL DISTRIBUTION OF *Mecistogaster lucretia* THROUGHOUT ITS RANGE.

Considering the ages and dates of the British Guiana imagoes, the greatest number of individuals (five males, one female) taken in any one month is in August, wherein young, semi-adults and adults are equally represented. Young and adult were collected also in March and in November. *Lucretia*, like *linearis*, is, therefore, apparently to be found as imagoes throughout the year. Except for November, however, the months in which the two species have been collected are not the same, although not far apart. The British Guianan seasons in which *lucretia* imagoes have been obtained are the short dry (Feb., March), the end of the long wet (July) and the end of the long dry (Nov.). Finally, a very adult female was taken by Dr. Schaus at Cayenne, in December, 1903 (U. S. National Museum), which is in the beginning of the wet season, only two seasons being recognized here as against the four in British Guiana.<sup>22</sup>

In the Academy of Natural Sciences of Philadelphia are two adult males from Cariquito, Venezuela, collected by Stewardson Brown on Jan. 22, 1911. In an account of his expedition by Stone,<sup>23</sup> Cariquito is located on the south shore of the peninsula of Paria. Judging from the rainfall records from the nearest localities, Río Caribe and Ciudad Bolívar, January is at the end of a wet season at Cariquito.<sup>24</sup>

These discussions of the seasonal distribu-

<sup>22</sup> Reed, 1928, pp. 5, 7-8. Miller, 1931, p. 75. Carlson, *Geography of Latin America*, revised edition, p. 352, 1943 (New York, Prentice Hall).

<sup>23</sup> 1913, *Proc. Acad. Nat. Sci. Phila.*, 65:189.

<sup>24</sup> Reed, l. c., p. 10; Carlson, l. c., p. 336.

tion of *M. linearis* and of *M. lucretia* are prompted by the results of one year's observations in Costa Rica which seemed to indicate that imagoes of *M. modestus*<sup>25</sup> fly in that country only at the beginning of the wet season.

ii. Megapodagriinae T. & F., 1938.

*Megapodagrion megalopus* (Selys, 1862).

Kangaruma, 15.II.1921, one male, abdominal segments 6-10 lost. Distribution: Amazon valley (Selys, 1862, 1886).

iii. Argiinae T. & F., 1938.

*Argia*

By Leonora K. Gloyd

(I have asked Mrs. Gloyd, as the one best acquainted with this genus, to examine and report on the material in question. This she has kindly done as follows. P. P. C.)

*Argia* sp. A, group of *oculata* Hagen.

Kartabo: 12.III.1924, one male; III.9.1926, one female; III.26.1926, one female; 3.IV.1924, one male (abd. segs. 7-10 lost); 8.VI.1921, one male; 20.IX.1920, one male (abd. segs. 6-10 lost); not dated, one female, No. 20357, abdomen lost; also July-August, 1926, by Dr. Charles Hodge IV, one male.

These males are not quite the same as my specimens of Sp. 26<sup>26</sup> from Venezuela which were compared with the type of *oculata* at the M. C. Z. in 1935, nor of Sp. 19<sup>26</sup> from Colombia (which may prove the same as Sp. 26. Segments 3-5 of this series have much more blue and there are slight differences in the superior appendages which are difficult to describe. Neither are they the same species as either of two belonging to the *oculata* group Dr. Geijskes sent me from Dutch Guiana. This group is going to take a tremendous amount of study and it may be that by the females we shall know them! Dr. Geijskes's males had such slight differences from Sp. 19 they could have easily been identified as the same but the females are quite distinct. So if these three females from Kartabo belong to the five males from the same locality, and I think they do, then here is another member of the near *oculata* group.

These females have a low tubercle with a depression mesad which forms a shallow pit beneath the short overhanging projection of the mesostigmal lamina; *oculata* has neither pit nor tubercle.

*Argia* sp. B.

Kartabo: 1922, one male (left front wing lost).

<sup>25</sup> Calvert, 1911, *Ent. News*, 22 (9): 402-411; Calvert, A. S. & P. P., 1917, *A Year of Costa Rican Natural History*: 230-243. See also Picado, C., 1913, *Bull. Sci. France & Belg.*, (7) 47 (3): 346-7.

<sup>26</sup> Temporary numbers given by me to species in sorting and making a preliminary study of the huge amount of *Argia* material accessible to me. L. K. G.

Same as my Sp. 16,<sup>26</sup> "Near *sordida* and *ulmeca* in Calvert's keys. May be undescribed species. P. P. C. & L. K. G. Sept. 10, 1934."

*Argia* sp. C.

Kartabo: 22.X.1920, one female, not dated; nos. 20340 and 24449, two females; Hadas Clearing 14/6/22, one female. All four females have lost abd. segs. 7-10 or more.

To me these specimens look like my Sp. No. 1<sup>26</sup> or No. 14<sup>26</sup> of the *indicatrix* group. Species 1 is from Belem, State of Para, Brazil, and is near, or, *indicatrix*; Sp. 14 is from British Guiana and as nearly as I can make out is what Sjöstedt redescribed as *Argia impura* but Rambur's type of *impura* has abdominal segments 7-10 missing and without a more critical study of several other species which are similar in size, coloration and general appearance, I can neither agree nor disagree with his determination.

*Argia* sp. D.

Kartabo: IV.6.1924, one female (abd. segs. 6-10 and left front wing lost).

My Sp. 8.<sup>26</sup> Color pattern, wings (postquad. cells 3-3), shape of pterostigma, mesostigmal lamina, etc., agree very well. Species 8 according to our mutual studies is still an undescribed species. My sample specimen is from Manaos, Amazonas, Brazil.

*Argia insipida* Hagen, 1865.

Essequibo River below [between?] mouths of Potaro and Rupinuni, IV-V, 1920, George B. Fox, one teneral female in collection of the Academy of Natural Sciences of Philadelphia.

Males of this species are very near *pipila* but differ in extent of blue in color pattern as well as in appendages. Here again it is the females which are most easily distinguished. *A. ierea* Geijskes is a synonym. *A. pipila* females, as stated in the original description, have no mesepisternal tubercles, *A. insipida* does have them.

Distribution of *insipida*: British and Dutch Guiana. See footnote 8, antea, page 49, on the reported occurrence of this species in the West Indies.

iv. Coenagriinae T. & F., 1938.

*Leptagrion beebanum* n. sp.

(Plate I, figs. 1, 2).

Kartabo, V.4.1924, one male, holotype, collection of Dr. William Beebe, deposited by him in the Academy of Natural Sciences of Philadelphia, No. 9275.

Wings: Anal vein separating from the hind margin of the wing slightly proximal to the cu-a cross-vein by a distance one-fourth or less of the length of that cross-vein, which is a little nearer to the level of the second than of the first antenodal. Cross-



vein descending from the subnodus not continued directly to the hind wing-margin, the marginal cell against which it ends pentagonal (hence like *Leptagrion*, Williamson, *Ent. News*, 28:242, 1917) but not high and the adjoining marginal cells not high (hence not like *Leptagrion*, l. c.). M2 arising at the 7th postnodal (front wings) or 6th (hind wings), Rs and M3 widely separated at the proximal cross-vein between them. Pterostigma with both proximal and distal ends oblique, nearly parallel, the proximal slightly more oblique than the distal; brown, surmounting less than one cell, costal edge 1.09 mm. (front wing), 1.18 mm. (hind wing). Postnodals 13 (right), 14 (left), M1a arising at the 10th (front wings); 13 (right), 12 (left), M1a arising at the 9th (hind wings). Upper side of the quadrilateral, front wings, subequal to the inner (proximal) side and .3 as long as the lower side; hind wings, twice as long as the inner side, half as long as the lower side. Three ultratracheal, antenodal cells on all four wings.

Most of the legs missing, only one tarsal claw (probably of a first leg) preserved, with a distinct tooth much shorter than the tip of the claw beyond the tooth.

General color black, in many places with a metallic blue or violet reflection, as on the nasus, vertex near each eye and abdominal segments 2-6. Labrum shining black. Labium and rear of head near the "pale clay yellow" of Smith's Glossary.<sup>27</sup> Labium cleft in its apical .46. No pale postocular spots.

Hind margin of prothorax convex, somewhat flattened; propleura pale, faded (color in life?).

Mesepisternum at its anterior (inferior) end with a pale yellowish or greenish antehumeral vitta about .7 mm. long. Mesepimeron for most of its length with a pale greenish stripe. Most of the metapleuron, of the metinfraepisternum and of the pectus pale greenish, with a brownish-black streak on the upper half of the second lateral (metapleural) suture and a short transverse blackish streak near the hind end of the pectus.

Abdomen: Intersegmental articulations of segments 1-5 narrowly pale cadmium yellow (Smith, l. c.), mid-dorsally interrupted on 4 and 5; sides of 1-6 inferiorly pale yellowish, rising higher at the bases of 3-6. Dorsal surface of 7-10 partly covered by an incrustation of foreign material which conceals their color pattern, but apparently black, unmarked. Tenth segment not elevated at its hind end, which latter, in dorsal view, is widely emarginated for two-sevenths of the segment's length. On view-

ing the hind surface of 10 from above and behind, there is seen, immediately below the hind dorsal margin, a distinct, sharply margined groove which extends from the level of the middle of one superior appendage to the level of the middle of the other superior appendage; each end of this groove is closed.

Superior appendages one half as long (in profile view) as segment 10, in dorsal view directed nearly straight caudad and showing an infero-internal lamella in the proximal two-thirds of their length; this lamella rounded at its apex and ending nearly at right angles to the remaining superior part of the appendage, which latter tapers to a slender apex bent mesad at its tip and ending in a slight hook. In profile view, the appendage is two-branched, upper branch twice as long as the lower; the distal end of the lamella above mentioned terminates as a convex projection at three-fifths the appendage-length, beyond which the upper branch tapers to an acute tip directed slightly dorsad; lower branch half as long as the upper branch and about three-sevenths as high thereof at base, forming a slender tapering process, curved slightly dorsad and ending a little short of the terminus of the lamella of the upper branch.

Inferior appendages, in profile view, hardly shorter than the lower branch of the superior appendages; the height of one appendage equal to one-half of the height of the tenth segment; upper third of the appendage produced as a blunt cone directed nearly straight caudad.

Abdomen 49, hind wing 32 mm.

This species, named in honor of the Director of the Kartabo Station, belongs in de Selys' group of *L. andromache* and *elongatum*, but differs from both of them in the form of the abdominal appendages and by the oblique pterostigma surmounting less than one cell; *andromache*, moreover, has the pterostigma "presque carré."

#### *Leptagrion* sp.

Kaïeteur, British Guiana, 18.II.1921, one male, abdominal segments 8-10 lost.

Related to *L. elongatum* Selys, but differing therefrom in the (oblique) shorter pterostigma which surmounts only one cell on all four wings, the presence of a black stripe on the humeral suture for its entire length, only half as wide as the middorsal black stripe, and a still narrower brown stripe on the whole length of the second (metapleural) lateral suture. Abdominal segments 1-7 37 mm., hind wing 26 mm. Owing to the absence of the specifically important abdominal appendages, I give this insect no specific name.

#### *Aeolagrion demerarum* Williamson, 1917.

Williamson, E. B., 1917, *Ent. News*, 28 (6):244, figs. (male apps.), pl. XVIII, fig.

<sup>27</sup> Smith, John B. Explanation of Terms used in Entomology, plate IV, fig. 22. Brooklyn Entom. Soc., 1906. The title here given is that of the two title pages of the writer's copy, but the back of the original buckram binding reads "Glossary of Entomology."

22 (venation). Geijskes, 1941, *Ann. Ent. Soc. Amer.*, 34:722, fig. 2 (nymph).

Kartabo, two males, one dated, 8.VI.1921; both lack heads.

There is a male from Paramaribo, Surinam, by Miss Katherine Mayo, in the collection of the Academy of Natural Sciences of Philadelphia.

All three males have been compared with a paratype from Georgetown, British Guiana, Jan. 25, 1912, by L. A. and E. B. Williamson and R. J. Rainey, received from Mr. E. B. Williamson, with which they agree.

All four males show a structural feature not mentioned in the original description: On each mesepisternum, at its anterior end, near its lateral margin, is an erect triangular process (mesostigmal lamina), about .14 mm. high, when viewed in profile and slightly from below; directed dorsad and laterad, blue anteriorly, its apex black; it is situated directly behind the "round lateral wing" of the same side of the hind prothoracic border.

Since writing the preceding paragraph, I have received three males and two females of *demerarum* from the Botanic Garden at Paramaribo, collected and sent to me by Dr. D. C. Geijskes. They are dated 19.VI.1939, 10 Oct. and 20.Dec.1938. The females also possess a mesostigmal lamina, less prominent (.09 mm. high) than in the male, the apex (which is triangular and directed laterad in the male) rounded off, the black of the apex continued caudad as a minute metallic green spot on to the anterior surface of the mesepisternum; this minute spot absent in all seven males.

Distribution: British and Dutch Guiana.

***Acanthagrion adustum* Williamson, 1916.**

Williamson, E. B., 1916, *Ent. News*, 27 (7):320, pl. XVII, figs. 1, 2 (male apps.), 10 (mes. stigma female). Geijskes, 1943, *Ann. Ent. Soc. Amer.*, 36:180, pl. VI (nymph).

Kartabo, Odon. 19, LAMA 17, one specimen, abdomen lost.

Agrees well with the description and with a paratype from Wismar, British Guiana, Feb. 15, 1912, by L. A. and E. B. Williamson and R. J. Rainey, received from Mr. Williamson, with which it has been compared.

Distribution: British Guiana.

***Metaleptobasis tetragena*<sup>28</sup> n. sp.**

(Pl. I, figs. 20-22).

Kartabo, July-August, 1926, by Dr. Charles Hodge IV, one female, not fully matured, holotype, to be placed in the collection of the Academy of Natural Sciences of Philadelphia, by the kindness of Dr. Hodge, No. 9274.

Wings: M2 arising at the sixth postnodal (front wings), at the fifth (hind wings); A and Cu2 in the same straight line<sup>29</sup> (all wings). Pterostigma longer than wide, grayish, surmounting less than one cell on all four wings, costal margin .71 mm. (front wing), .66 mm. (hind wing), proximal end oblique, distal end less so. Twelve postnodals (all wings), M1a arising at the 10th (all wings), Cu2 ending at the level of the 6th postnodal (3 wings) or 7th (left hind wing). Antenodal ultraquadrilateral cells on all wings three.

Legs yellow, with black or brown spines, 6 on the outer row of the third tibia, 8-9 on the inner row; tarsal claws without a tooth.

Labium as noted by Williamson for *M. mauritia* and *M. manicaria*. Labrum obscure ochre; rhinarium and nasus dark brown; frons anteriorly ochreous, superiorly black, a transverse yellowish stripe laterad to each paired ocellus; vertex dark metallic green and violet; occiput and postero-superior margin of vertex yellowish; rear of head ochraceous; antennae: first and second segments pale cream (?), anterior surface of the first and distal end of the second brown.

Prothorax ochraceous; hind margin with two erect processes, each about .07 mm. wide and a little longer, apex almost transversely truncate, processes separated by a subrectangular interval of about .11 mm. width. (Pl. I, figs. 20, 21).

Thorax with a mid-dorsal metallic violet stripe about .57 mm. wide, remainder of thorax pale brown becoming yellowish on the sides; on each lateral margin of the violet stripe, at its anterior end in dorsal view, is a straight, slender, tapering process ("horn") .45 mm. long, diverging widely cephalad from its fellow; in profile view each process is directed upward at its base, but soon directed cephalad and overhanging the prothorax; at their bases these horns are .24 mm. apart. (Pl. I, figs. 20-22).

Abdomen brown dorsally, with a metallic reflection, a transverse, basal, pale green ring at the anterior end of segments 2-6, interrupted mid-dorsally by the brown and confluent with an inferior stripe of the same pale green on the same segments; posterior third of 8, half of 9 and all of 10 dorsally paler, yellowish. Appendages of 10 reaching to the level of the hind end of 11. Genital valves barely projecting caudad beyond the level of 11; serrulations on their ventral margins about six in number, located in the distal third of the valves, each one wider than high, rounded at apex, first to third separated from each other by 2-3 times the width of each, fourth to sixth separated by

<sup>29</sup> Cf. Williamson, 1915, *Proc. U. S. Nat. Mus.*, 48 (2089):637, lines 26-28, in which is an easily overlooked statement of this peculiarity as a venational generic character of *Metaleptobasis*.

<sup>28</sup> τέτρα = four, γέν = be born, in allusion to the four thoracic horns.



the width (or less) of each, first to third each bearing a seta, fourth and fifth each two, sixth (which is close to base of palp) none.

Abdomen 35 mm., hind wing 22 mm.

This female differs from the females of other described species of *Metaleptobasis* or *Leptobasis* in having subparallel processes on the hind margin of the prothorax and longer, cylindrical, diverging "horns" at the anterior end of the mesothorax. The nearest species is *quadricornis* Selys of Para, whose thoracic armature is thus described: "Prothorax roussâtre, le bord postérieur presque droit et chacun de ces côtés portant une corne aplatie, redressée et penchée vers le thorax dont le bord antérieur porte aussi deux petites pointes coniques, redressées plus courtes, une de chaque côté, mais assez rapprochées et dirigées vers le prothorax," and again: *quadricornis* "les deux cornes du thorax et celles du prothorax presque égales coniques, assez courtes," (Selys, 1876). The italics are mine to emphasize the differences. *Quadricornis* is described also as having the pterostigma covering one cell, the internal side hardly oblique.

*Ceratura capreola* (Hagen, 1861).

Geijskes, 1941, *Ann. Ent. Soc. Amer.*, 34 (4):729, fig. 5 (nymph).

Kartabo, VRS, Odon. 6, one male; Odon. 40, one citrus female.

Both male and female have seven postnodals on the front wings, six on the hind wings, thus agreeing with "the individuals from Brazil, of both sexes, (which) have usually one more postcubital (postnodal) on both front (7) and hind (6) wings than the majority of Mexican and Central-American examples possess." (Biol. Centr.-Amer. Neur. 132, 1903). The dorsum of the eighth abdominal segment of this male has the anterior .57 mm. black, the posterior .4 mm. blue.

Distribution: Cuba, Jamaica, Puerto Rico, Martinique and Vera Cruz, Mexico, to Rio Grande do Sul, Brazil, and Jujuy, Argentina.

v. *Protoneurinae* T. & F., 1938.

*Neoneura joana* Williamson, 1917.

Williamson, 1917, *Trans. Amer. Ent. Soc.*, 43:213, 215, 242, 7 figs.

Kartabo, VI.4.1924, one male lacking abd. segs. 7-10; 9.VIII.1920, one male lacking abd. segs. 4-10.

Both specimens were compared with a male paratype from Tumatumari, British Guiana, Feb. 9, 1912, at the Academy of Natural Sciences of Philadelphia. The remaining portions of the June male agree well with Williamson's detailed description and figures, except that the black bar running from either side of the median ocellus does not quite reach the antenna of the same side, although the remainder of this bar,

forward and backward from the antenna, agrees. The August male has the longitudinal black bar on either side of abdominal segment 2 reaching both base and apex of that segment, the black markings on the sides of abdominal segment 1 are not symmetrical.

Distribution: British Guiana.

*Protoneura calverti* Williamson, 1915.

Willmsn., 1915, *Proc. U. S. Nat. Mus.*, 48 (2089):620, 619, 632-635, pl. 41, fig. 1 (venation), pl. 43, figs. 11, 12 (thoracic color pattern), pl. 44, figs. 23, 24 (apps.).

Kartabo: July-Aug., 1926, Chas. Hodge IV, one male.

The Kartabo male differs from Williamson's description and figures and from two of his male paratypes from Tumatumari, British Guiana, Feb. 11, 1912, with which it has been compared, by having the orange red spots on the mesepisternum reaching farther dorsad and caudad, attaining a length of 1.65 mm. as compared with 1.18 mm. in the paratypes, by the longer yellow area, 1.65 mm., on the metepisternum, vs. 1.18 mm. in the paratypes, and by the black on the second lateral thoracic suture being narrower (.19 mm. vs. .33 mm.). In the two paratypes the inferior appendages project as far caudad as do the superiors; in Williamson's figures and in the Kartabo male the inferiors extend beyond the level of the superiors; the shape of the appendages appears to be the same in all three males. The Kartabo male has all surfaces of the middle third of the third femora yellow. The three males have 9-10 postnodals on the front wings, 8-9 on the hind.

Distribution: British Guiana, Trinidad.

GOMPHINAE S. & H., 1850 (as Gomphines).

i. *Ictinogomphinae* T. & F., 1940.

*Zonophora batesi* Selys, 1869.

Selys, 1869, *Bull. Acad. Belg.*, (2) 28 (8): 198. Needham, 1944, *Trans. Amer. Ent. Soc.*, 69: 219, pl. XVI, fig. 19a (genit. 2d abd. seg. ♂).

*Zonophora bodkini* Campion, 1920, *Ann. Mag. Nat. Hist.*, (9) 6:136, pl. VII, figs. 10-14 (venation, vulv. lam., mand., max.).

"Essequibo R(iver) below [between?] mouths of the Potaro and Rupinuni, British Guiana, V.1920, George B. Fox," one male, in coll. Acad. Nat. Sci. Phila.

The mouths of the Potaro and Rupinuni (also spelled Rupununi and Raponunni) Rivers, where they empty into the Essequibo, are about 100 miles (150 km.) apart.

This male has abdomen 58 mm., hind wing 48, its maximum width 13, pterostigma of front wing 5.48, width of head 9.5, 1st femur 4.66 long, 2d femur 5.72, 3d femur 7.93 mm.; antenodals, front wings, 23 and 24, 1st and 6th or 8th thicker, hind wings, 16, 1st and 8th thicker; postnodals, front wings, 15 and 16, hind wings, 17 and 18.

Compared with Selys' description of *batesi*, from Fonte Boa, Upper Amazons, Brazil, this male has the abdomen slightly longer (type 55 mm.) the hind wing slightly shorter (type 50 mm.), pterostigma slightly shorter (type 6 mm.), the ante- and postnodals fewer. Pale markings of the thorax not distinct but apparently not different. Abdominal segment 1 with an orange or yellow spot each side in the posterior half; two yellow or orange spots on each side of 2, one anterior, the other posterior; basal yellow or orange spot on each side of 3 from base to transverse median suture, where it rises almost to the mid-dorsal line, behind this suture a narrower stripe to .9 of the segment's length; a narrower basal stripe each side of 4-6, pointed posteriorly, reaching to the transverse suture on 4, not as far on 5 and 6; the basal ring on 7 reaching to the same suture, interrupted by a mid-dorsal black line. No orange or yellow marks on 8-10. Branches of the inferior appendage spread far wider apart (3.44 mm.) than are the superiors (2.70 mm.). The hamules, penis and especially its vesicle agree fairly well with the figures for this species given by Needham (1944), although the cornua of the penis are extended farther.

The single female from Tumatumari, Potaro River, British Guiana, described by Mr. Campion (1920) as *Zonophora bodkini*, is nearly the same size as the present male, but the hind wing is longer (52 mm.), and in most respects, other than those of sex, this male agrees with Mr. Campion's description, including the stout tubercle behind each of the paired ocelli. The hind margin of the occiput of this male, however, is almost straight, barely concave, the ante- and postnodals are slightly fewer, the pterostigma decidedly shorter and there is a brace-vein at its proximal end.

I think the differences above listed between the present male and the description of *batesi* are not specific and that *bodkini* is the corresponding female.\*

Distribution: Guianas, Amazon valley.

***Progomphus dorsopallidus* Byers, 1934.**

Byers, 1934, *Occas. Papers Mus. Zool. Univ. Mich.*, 294:1, pls. I, II.

Kartabo: one female, lacking abd. segs. 4-10.

The female of this species has not been described. The present specimen agrees fairly with the description of the male, especially with the thoracic color pattern. The

posterior margin of the occiput has a slight tendency to form a median excision. Wings colorless, hind wing 20 mm. Pterostigma pale clay yellow, smaller than described, 2.83 mm. long on costal margin, surmounting 4-4½ cells. Antenodals, front wings, 15 and 13, hind wings 10 and 11; postnodals, front wings, 10 and 9, hind wings, 10; all the triangles 2-celled.

*Dorsopallidus* was described from San Estéban, Venezuela.

***Gomphoides fuliginosa* Hagen, 1854.**

Needham, 1944, *Trans. Amer. Ent. Soc.*, 69:195, 197, pl. XV, fig. 8e, pl. XVI, fig. 8f.

Kartabo: one nymphal exuvia, 7.IX.1920.

I have asked Prof. Needham to study this exuvia in the belief that he would be more able than I to identify it in the course of his examination of allied material. His results are contained in his paper cited above.

Distribution: British and Dutch Guiana.

***Phyllocycla* new generic name**

for *Cyclophylla* Selys preoccupied. Type species: *signata* Hagen, as for *Cyclophylla*, fixed by Kirby, 1890, *Cat. Odon.*, p. 74.

Cowley (*Ent. Mo. Mag.*, 70:244, 1934) pointed out that the name *Cyclophylla* Selys, 1854, was preoccupied by Brandt, 1837, in *Coelenterata*<sup>30</sup> but demurred to giving a new name for *Cyclophylla* on the ground that it was unnecessary, since the three genera or subgenera, *Gomphoides*, *Cyclophylla* and *Aphylla*, had been combined into one for which he accepted Muttkowski's 1910 name, *Negomphoides*.

Now that Prof. Needham has resurrected these three genera (*Trans. Amer. Ent. Soc.*, 65:365, 388, 389, 1940) on partly new characters, it seems necessary to adopt a new name for *Cyclophylla*, hence the present proposal of *Phyllocycla*. However, the distinctness of the three groups, based on Needham's new characters drawn from the anal field, is still not sharp, as attention is called below to variations in *Phyllocycla signata*, *Ph. bartica* and *Aphylla alia* in the number of cells in the anal loop and in the course of vein A2 which are not in accord with his characters for *Cyclophylla* (*Phyllocycla*).

***Phyllocycla signata* (Hagen, 1854), (new combination).**

*Cyclophylla signata* Needham, 1943, *Bolet. Entom. Venezol.*, 2(4):201.

Kartabo, 13.iii, one male.

Abdomen 37 mm., hind wing 27, pterostigma (right front wing) 3.30, third femur 5.10, width of head 6.5, width of hind wing 7.85 mm.

\* Subsequent to the reading of the first proofs of this article, I received from Dr. Erich Schmidt, of Bonn, Germany, proof sheets of a paper by himself entitled "Revision der Gattung *Zonophora* Selys Deutsche Entom. Zeitschrift 1941, Heft I-11 (9 Juli 1941) p. 76ff." Dr. Schmidt has not distributed his separata as yet. His paper is included in the Insecta section of the Zoological Record for 1945. In it he has the same conception of *Z. batesi* as set forth above and has likewise concluded that *Z. bodkini* Campion is the female of *Z. batesi*. This note is inserted here to record that he and I—have independently reached the same conclusions.

<sup>30</sup> Neave, Nomenclator Zoologicus, 1939, I:920, gives the reference for Brandt's name as 1837, *Bull. Sci. Acad. Imp. Sci. St. Petersb.*, 1 (24): 187, which I have examined. The title of Johann Friedrich Brandt's paper in question is "Remarques sur quelques modifications dans l'arrangement de l'ordre des Acalephes discophores ou ombrellifères," in which the "Subgenus [Carybdea] *Cyclophylla* Nob." is briefly characterized and two species, *Carybdea periphylla* Per. et Les. and *Carybdea bicolor* Quoy et Guim., are referred to it.



This male corresponds closely with de Selys and Hagen's descriptions and figures of 1854 and 1858 of *signata*, based on a male from "Bresil" in the Berlin Museum and a female from Venezuela by Appun in Hagen's collection. Such differences as I have found (in addition to slight ones in size which the above dimensions indicate) are: Occiput dark brown, hind margin nearly straight (shown as slightly bilobed in Hagen's pl. 12, fig. 4d of 1858); markings of the abdomen not very distinct; on moistening the insect with alcohol, the pale basal spots reach apparently to one-tenth of the segment's length on 3, one-fifth on 4, .15 on 5 and 6 and .17 on 7; 10 is dark brown dorsally; discoidal triangle of front wings 3-celled by 3 veinlets, one from each side, which meet in the center; discoidal triangle of hind wings and internal triangle of front wings each 2-celled, internal triangle (subtriangle) of hind wings free; antenodals on the front wings 20 and 19, on the hind wings 14; postnodals on the front wings 12, on the hind wings 13.

The following particulars may be added: Pale green antehumeral stripe .8 mm. wide at its lower (anterior) end, just above its union with the green mesothoracic "half-collar" and where it is separated from the brown mid-dorsal carina by exactly its own width, the right and left antehumerals converging upward. The much narrower (.25 mm.) pale humeral stripe complete. A pale green stripe (.5 mm. wide) on most of the length of the brown mesepimeron; a subequally wide pale green stripe on most of the length of the brown metepisternum; between it and the green of the metepimeron is a brown band, about 1 mm. wide, on the second lateral suture; by far the larger part of the metepimeron is pale green to the small brown triangle at its postero-inferior angle.

Anal loop of 3 cells (1 in front, 2 behind) not sharply defined posteriorly, A1 and A2 approximating slightly behind it, thence diverging to the hind margin of the wing; distal portion of A2 convergent with A3. A basal subcostal cross-vein on all wings.

*Signata* has not appeared in the literature since de Selys and Hagen's *Monographie des Gomphines* of 1858 until it was compared with *C. anduzei* by Needham (1943).

Distribution: Venezuela, Guiana, Brazil.

***Phyllocycla bartica*, new species.**

(Plate I, figs. 7-15).

?*Cyclophylla* sp. No. 6, Needham, 1940, *Trans. Amer. Ent. Soc.*, 65:379 (nymph).

Kartabo: III.4.1926, one female; III.9.1926, one male holotype; III.11.1926, one female; 18.5.1919, one male; July-Aug. 1926, one female by Dr. Charles Hodge IV, in the collection of the Academy of Natural Sciences of Philadelphia, paratypes. Holotype ♂ No. 9277 Acad. Nat. Sci. Phila.

Also, I have had the opportunity to include in the following description one pair taken in copula, the female with a cluster of eggs at the vulva, four other males and one other female from Itaituba, on the Rio Tapajos, Brazil, I, III, and V, 1922, by A. H. Fassl, from the collection of the late Dr. F. Ris (Senckenberg Museum, Frankfurt am Main), and one male from Kartabo, British Guiana, taken by Dr. W. T. M. Forbes, between November 1 and 5, 1920, now in the Cornell University collection—all lent to me by the Museum of Zoology, University of Michigan, through the kind interest of Mrs. Leonora K. Gloyd; these likewise are paratypes.

♂. Face (except rhinarium=anteclypeus), labrum, vertex and occiput reddish brown. Rhinarium, frons, above its transverse carina, pale green, but a narrower reddish-brown band on its upper surface immediately in front of the ocelli. Hind margin of occiput almost straight. Rear of head and labium perhaps pale green in life.

Prothorax reddish-brown. Pterothorax dark brown, mesothoracic "half collar" united broadly with an antehumeral stripe on each side to form a green figure "7", the antehumeral stripe widest (.5-.8 mm.) at its lower end just above where it joins the half-collar and where it is once to nearly twice as far from the green-lined mid-dorsal carina as its own width; right and left antehumerals converging toward their upper ends where each is .42-.65 mm. distant from the same carina. Sides of thorax mostly dark brown, the following green: a complete stripe .3-.4 mm. wide, immediately in front of the humeral suture, a mesepimeral stripe .42-.65 mm. wide at mid-height, for almost the whole length of the sclerite, a metepisternal stripe .57-.66 mm. wide, close to the second lateral suture, and most of the metepimeron and pectus.

Abdominal segments 1 and 2 brown, a dorsal basal spot on each side of 1 (or the two united), a mid-longitudinal stripe and the auricles on 2 and the sides inferiorly of both 1 and 2, pale green; 3-10 blackish, a longitudinal reddish-yellow stripe on each side of 3-7, reaching .8 of the length of the segment on 3, .86 on 4, .7 on 5, .3 or more on 6, .83 on 7 (for shorter distances on other males); some reddish on each side of 8 and 9, and a small yellowish spot on each side of 10 near its hind margin.

Lateral margins of 7 widening gradually from base to apex. In profile 8 shows a distinct lamellate expansion of the ventral tergal margin for its entire length, increasing in depth caudad to a maximum of .25-.38 mm. at three-fourths' the segment's length and terminating in a circular quadrant, ventral margin with 12-14 denticles; expansion on 9 having a maximum of .1 mm. at mid-length of the segment.

Superior appendages 1.70-2 mm. long, longer than 10, subequal to 9, blackish or reddish-brown; in dorsal view each directed nearly straight caudad in its proximal .6, then curved mesad; at .4-.55 length there is an acute, pale-tipped tooth on the upper, carinate margin; opposite this tooth is a slight convexity or a straightness on the otherwise concave mesal ventral margin; at seven-eighths' to nine-tenths' length the outer margin is strongly angled mesad and thence extends in a nearly straight line to the apex; the extreme apex is rounded and finger-like and slightly proximal to it the inner margin is excised, but convex proximal to the excision; the inner (mesal) surface of the appendage is grooved for its entire length, the groove passing under (ventral to) the ante-apical convexity just described. In profile view each appendage as a whole is directed slightly dorsad and its height regularly decreases, especially on its ventral margin, from base to apex; the terminal sixth or more is obliquely truncated ventrad and caudad; the upper margin shows two shallow concavities, the first from base to the superior tooth (above described) at .4-.55 length, the second, shallower, from the tooth to the strong superior angulation at seven-eighths' length or more where the truncation of the apex begins; the inferior margin shows a sharp, conical, basal tooth, whence the margin is slightly convex, thence slightly concave, ascending to the beginning of the apical truncation.

Inferior appendage visible in dorsal, but hardly in profile, view; in dorsal view about one-fifth as long as the superiors, a little wider than long, distal margin with a slight median notch, not always present.

Auricles with 7-10 black, marginal denticles. Genitalia of 2 as shown in figs. 8-10, Plate I. Posterior cleft of the "gaine" (Hagen, 1858, pl. 12, fig. 4j,) = "hood of the penial peduncle" (Needham, 1943, p. 202) with a tooth at the bottom, as in Hagen's figure cited. Cornua of the penis finely serrate as figured by Hagen (l. c., pl. 12, fig. 4i).

Legs reddish, distal ends of the femora and the tarsi reddish-brown.

Wings faintly smoky, stigma brown, surmounting  $4\frac{1}{2}$ -7 cells, a basal subcostal cross-vein<sup>31</sup> on all wings, all triangles (except the free internal of the hind wings) 2-celled (or the discoidal triangle of the front wings 3-celled in seven out of sixteen wings), two ultra-triangular rows (preceded by three cells on the hind wings) increasing to three rows beyond the level of separation of the subnodal sector (Rs bridge) and median vein (M1-2), anal loop of two cells, A1 and A2 converging behind it, thence diverging to the hind margin of the wing (see Pl. I, fig. 13), with one (1♂) or two (7♂) cells

between them immediately posterior to the anal loop. Antenodals on front wings 14-19 (17), on hind wings 11-15 (13). Postnodals on front wings 9-13 (10), on hind wings 10-13 (11), numbers in parentheses the most frequent. First and fifth or sixth antennodals stronger on the front wings, first and fifth on the hind wings. Venation dark brown.

Dimensions of ♂: abdomen 37.5-40.5 mm., hind wing 27-29, pterostigma, front wing 3.59-3.68, third femur 4.87-5.0, width of head 6.25-7.70, width of hind wing 7.00-8.00 mm.

♀. Differs from the male as follows: Pale antehumeral stripe at its upper end .47-.8 mm. distant from mid-dorsal carina, its maximum width at lower end .9 mm. Sides of thorax apparently the same. Reddish-yellow on the sides of abdominal segments reaching to the full length of 3-7. Lateral expansions of 8 to .09-.14 mm., of 9 to .05-.09 mm. Segment 11 .36 as long as 10, conical, yellowish, Appendages 1-1.4 mm. long, subequal to 10, yellowish or ochre, straight, slender, tapering to an acute apex. Vulvar lamina (Pl. I, fig. 14) .38-.5 mm. long, .24-.28 as long as the sternum of 9, 1.0 mm. wide at base, bifid in distal half or two-thirds, lobes triangular, interval between lobes nearly 90°, interval between apices of lobes .47-.57 mm. Discoidal triangle 3-celled in right front (2♀) or both front (2♀) wings. Antenodals on front wings 16-20 (16 and 18 equally frequent), on hind wings 12-14 (13). Postnodals on front wings 11-12 (11), on hind wings 12-15 (13). The female of III.11.1926 has the first and sixth antennodals on the hind wings thicker.

Dimensions: abdomen 34-39 mm., hind wing 29.5-31, pterostigma of front wing 3.40-4.09, third femur 4.91-5.20, width of head 6.5-7.20, width of hind wing 6.5-8.34 mm.

The younger female, taken by Dr. Charles Hodge, also may belong to this species. Its colors are paler. Head pale brown, the following pale green: a curved stripe on each side of the labrum close to the free margin, rhinarium (anteclypeus), a spot on each side of the nasus (postclypeus), frons above the carina but leaving a wider brown stripe in front of the ocelli. Most of the prothorax pale green, hind lobe pale brown. Pterothorax with a mid-dorsal yellow or pale green stripe .33 mm. wide, each green antehumeral stripe .5 mm. wide where it joins the mesothoracic half-collar, its upper end only .33 mm. distant from the mid-dorsal carina. Sides of thorax pale reddish, the pale green stripes present but not so clearly seen, owing to the partial wrinkling of the surface.

Abdomen pale greenish or reddish with blackish-brown markings as follows: an indistinct oblique line on each side of dorsum

<sup>31</sup> Two on the left front wing of one male.



of 2, a narrow mid-dorsal stripe on 3 and 4 from the transverse antemedian carina to four-fifths of each segment's length, a similar stripe on 5 and 6 for the entire length of each, a pair of oblique streaks diverging caudad on the hindmost fifth of 3-6; 7 largely pale with some blackish near its hind end and some for much of the length of 8-10.

Vulvar lamina more exposed, .42 mm. long, .21 as long as the sternum of 9, bilobed in its distal half, lobes widely triangular, each lobe a little more than 90° at tip and rounded, interval between lobes a little more than 90°, width of lamina 1.09 mm., distance between tips of lobes .42 mm.; the 9th segment has been accidentally flattened and more of the sternite of 9 immediately behind the vulvar lamina has been exposed, showing a transverse ridge, concave caudad in the middle and followed by a transverse low tubercle bearing many hairs; on each side of the middle line, immediately in front of this ridge is a small, shallow, darker brown pit. (Pl. I, fig. 15).

Wings clear, pterostigma pale clay-yellow (Smith's "Explanation"), surmounting 6-8 cells, discoidal triangle of both front wings 3-celled, internal triangle of front wings and discoidal triangle of hind wings 2-celled, also the internal triangle of right hind wing, that of left hind wing free. Three ultra-triangular cells precede the two rows on the left front wing and on both hind wings, the increase to three rows is at the level of separation of Rs bridge and M1+2 on both front wings and on left hind wing. Anal loop of two cells, shaped as in the above described 7♂, 4♀, with only slight differences in the lengths of the sides. Antenodals on front wings 19 and 20, first and seventh thicker on the right, on the hind wings 14, postnodals on hind wings 13 and 14.

Otherwise this female is as in the four females above described.

Dimensions of this ♀: abdomen 37 mm., hind wing 31.5, pterostigma front wing 4.0, third femur 4.53, width of head 7.2, width of hind wing 9.0 mm.

The venation of the present material of *bartica* agrees fairly well with that described by Needham (1940) for a nymph, *Cyclophylla* sp. No. 6, American Museum of Natural History, "Acc. 3928: came in with fishes from British Guiana." However, in these five female imagos, the distal portion of vein A2 is parallel, not convergent, with A3 on the hind wings of both sides, hence departing from one generic character for *Cyclophylla* as given by Needham (1940, p. 365); the eight males, on the contrary, agree with this character. There are five postanal<sup>32</sup> cells, three of them posterior to

the anal loop in three females, four postanal cells, two of them posterior to the anal loop in the remaining female and the males. There are two rows of cells between A2 and A3 from A to the wing margin on the right hind wing of the July-Aug. female, while on its left hind wing two rows begin one cell below A; in three females two cells between A2 and A3 begin only at two cells from the wing margin, i.e., two cells below A; in the males and one female there is but a single row of cells between A2 and A3, although the female has two marginal cells. Considerable variation in the cells of the anal area is, therefore, to be expected, although the anal loop is 2-celled in all thirteen imagos.

The specific name *bartica* here proposed is that of the district in which Kartabo lies.

In size and coloring *Ph. bartica* is very similar to *Ph. signata* Hagen. The males of *bartica* differ from that of *signata* in the smaller lateral dilatations of abdominal segments 8 and 9, in the shape of that of 9, in the superior appendages having a superior tooth at .4-.55 length, a more distinct angulation of the outer margin at seven-eighths' length, the ante-apical excision of the inner margin more abrupt and in having the acute, conical, inferior, basal tooth; and in the 2-celled anal loop of the hind wings. As mentioned under *signata* (antea), the Kartabo male of that species has the discoidal triangle of both front wings 3-celled, whereas in the types of *signata* it is 2-celled. Of the males of *bartica* here described, seven out of sixteen wings have this triangle 3-celled, the remaining nine 2-celled. Of the five females here referred to *bartica*, three have this triangle 3-celled symmetrically, the remaining two have it 3-celled and 2-celled asymmetrically. These five females are referred to *bartica* because of their symmetrically 2-celled anal loop, as in the *bartica* males, while in the single male of *signata* the anal loop is symmetrically 3-celled. The anal loop is not mentioned in the previous descriptions of *signata*.

The descriptions of other species referred, or referable, to *Cyclophylla* (*Phyllocycla*) or *Aphylla*, differ from *Ph. bartica* as follows:

In the absence of a superior tooth near the mid-length of the superior appendages: *ambigua* Selys, 1873, *anduzei* Needham, 1943, *brevipes* Selys, 1854, *caraiba* Selys, 1854, *cristatus* Needham, 1944, *cubana* Navas, 1917,<sup>33</sup> *curvata* Navas, 1933, *dentata* Selys, 1859, *distinguendus* Campion 1920, *edentata* Selys, 1869, *elongata* Selys, 1857, *gladiata* Hagen, 1854, *hesperus* Calvert, 1909, *molossus* Selys, 1869, *ophis* Selys,

<sup>32</sup> As marked by Needham, 1944, *Trans. Amer. Ent. Soc.*, 69: pl. XVI, fig. 4e, here including the two cells of the anal loop

<sup>33</sup> *Cyclophylla cubana* Navas, 1917, *Mem. Pont. Acc. Romana*, 3:3, may be the same as *Aphylla caraiba* Selys, 1854.

1869, *pachystyla* Needham, 1944, *producta* Selys, 1854, *protracta* Selys, 1859, *signata* Hagen, 1854, *sordida* Selys, 1854, *tenuis* Selys, 1859, *theodorina* Navas, 1933, *volSELLa* Calvert, 1905, and *williamsoni* Gloyd, 1933. Of these, *ambigua* differs also in the possession of a median notch in the hind dorsal margin of abdominal segment 10, *anduzei* in the form of the lateral margin of segment 7; *brevipes*, *cristatus*, *dentata*, *distinguendus*, *edentata* and *molossus* have the pale antehumeral stripe not united with the mesothoracic collar to form a figure 7; *cubana*, *gladiata*, *ophis*, *signata* and *sordida* have no stout, inferior, basal tooth on the superior appendages; in *gladiata* and *sordida* the pale humeral stripe is incomplete; *hesperus* and *protracta* differ in the lateral margins of abdominal segments 8 and 9; *ophis* has no angulation at seven-eighths the length of the superior appendage; still other differences are indicated in the respective descriptions.

Ris 1904<sup>34</sup> says of the superior appendages of *Cyclophylla argentina* Hagen, 1878, "dessen obere Kante nahe der Basis und an der Stelle der stärksten Krümmung gegen das Ende je ein ziemlich stumpfes Zähnchen trägt. Das Ende stumpf." His 1913<sup>35</sup> figure of the appendages shows the tooth "nahe der Basis" at about .36 of the appendage length.

For *Cyclophylla diphylla* Selys, 1854, it is stated of the superior appendages: "Le bord supérieur porte une tubercule à son premier tiers," but no mention is made or shown (in 1858) of an inferior basal tooth, and the lateral margins of 8 and 9 are different from those of *bartica*.

*Gomphoides eugeniae* Navas, 1927, has the superior appendages with a superior tooth before mid-length; in dorsal view rounded, not angulate, exteriorly where the appendage changes its direction; lateral margins of 8 and 9 differently shaped.

*Cyclophylla pegasus* Selys, 1869, has the superior appendages "portant en dedans à leur moitié un petit tubercule," the lateral margins of 8 and 9 almost rudimentary.

In *Gomphoides viridipleuris* Calvert, 1909, "at about half length the inner surface (of the superior appendages) bears a small blunt tubercle near the upper edge of the appendage," but in dorsal view the appendages are rounded, not angulate, exteriorly where the change in direction of the appendage occurs.

*Phyllocycla bartica* female differs from the descriptions of the following species of which the female only has been described:

*andromache* Selys, 1869, which has no pale mesothoracic collar and has short pale antehumeral bands;

*Aphylla cornutifrons* Needham, 1944, which has a pair of frontal horns;

*Gomphoides ictinia* Selys, 1878, which has the vulvar lamina reaching abdominal segment 10.

The description of *Cyclophylla obscura* Kirby, 1899, is insufficient to enable its specific recognition.

#### *Aphylla alia* n. sp.

(Plate I, figs. 16-19).

Kartabo, 19.VII.1920, one male, abdominal segments 5-10 and left hind wing beyond the triangle lost, holotype, No. 9276, Acad. Nat. Sci. Phila.

This male agrees with the first character for *Cyclophylla* listed by Needham, 1940 (*Trans. Amer. Ent. Soc.*, 65:365), viz.:

(a) Anal loop of two cells sharply defined at its rear by convergence of A1 and A2, but not with the second character, as

(b) the distal portion of A2 is not convergent with A3 but diverges somewhat from it and also from A1. (Pl. I, fig. 18.)

It agrees with the following Selys-Hagen (1858, pp. 216-217) characters for *Cyclophylla*:

(c) internal triangle (subtriangle) of the front wings of two cells;

(d) the same of the hind wings free;

(e) discoidal triangle of all wings 2-3 celled (here 2-celled); but disagrees with the following Selys-Hagen characters:

(f) labium (i.e., the median lobe or ligula) as long as wide (here wider than long);

(g) "pièce supérieure des parties génitales" (=anterior lamina) emarginate at middle (here a quadrangular plate narrowed posteriorly, reaching caudad against the anterior hamules) (Pl. I, fig. 17);

(h) anterior and posterior hamules, in profile view, almost equally prominent, the anterior more slender, curved strongly caudad and dorsad; in oblique view, an acute, posterior, basal tooth is visible near the floor of the genital fossa; posterior hamule, in profile view erect, at least twice as thick as the anterior hamule, with a bunch of long (.85 mm.) hairs, its apex acute and directed mesad (Pl. I, figs. 16, 17);

(j) "gaine du penis" (vesicle or first segment thereof), in profile view, acutely pointed ventrad; in rear view, this acute point corresponds to a transverse lamella whose margin is trifid, the teeth about .047 mm. long (Pl. I, figs. 16, 19);

(k) glans of penis (=4th segment) with two very long cornua (here the cornua are absent and the glans, in ventral view, is subquadrangular, .6 mm. long, .38 mm. wide at base, .57 mm. at apex, membranous, pale, near its mid-length with two very black denticles in an oblique line on each side of its median line) (Pl. I, figs. 16, 17);

(l) "cueillère" (=sheath of penis, Tillyard, 1917) elongate, slightly wider at apex

<sup>34</sup> Hamburger Magalhaensische Sammelreise, Odonaten, p. 19.

<sup>35</sup> Mem. Soc. Ent. Belg., 22:74.



with the merest suggestion of a median apical notch (Pl. I, fig. 17, sh).

The characters above lettered (b), (f), (g), (h), (j), (k), which differ from those given by Needham and by Selys-Hagen for *Cyclophylla*, approach or are identical with those of *Aphylla* and hence render doubtful the distinctness of these two "genera."

Other features of this male from Kartabo are: vertex, anterior surface of frons, nasus (postclypeus) except for a small yellow spot each side, lower margin of rhinarium (anteclypeus), labrum except for a yellow spot each side, rear of head except for a yellow spot each side near middle of eye-margin—dark brown (near Cologne earth or Roman sepia of Smith's Explanation, pl. iv, nos. 37 and 38). Occiput (its hind margin a straight line), superior surface of frons except a dark brown basal band in front of the ocelli, most of the rhinarium, genae, outer surface of mandibles—greenish-yellow. Labium near pale clay yellow (Smith, pl. iv, no. 22).

Prothorax: fore lobe brown pink (Smith, no. 21), middle and hind lobes greenish-yellow. Pterothorax predominantly darker brown than that on head, the following greenish-yellow: mid-dorsal carina, a transverse stripe ("collar") at anterior end of each mesepisternum for its entire width, an antehumeral stripe .8 mm. wide at mid-height, separated by a distance less than its own width from the mid-dorsal carina, diverging therefrom and from its fellow of the opposite side forward and downward, widened laterad at its upper end where it borders the ante-alar sinus, pointed at its lower end which does not touch the transverse mesepisternal stripe (hence *not* forming a figure 7), a stripe .57 mm. wide at mid-height on the mesepimera, a stripe passing through the metastigma around which it is enlarged but above which it is narrowed to .33 mm., a stripe on the metepimeron .98 mm. wide at mid-height, these three stripes wider at their upper ends which attain the upper margins of their respective sclerites. Interlar tergites with a mid-dorsal row of greenish-yellow or (on the scutella) gamboge spots. Pectus brown pink.

Abdominal segments 1-4: ventral surface dull yellow. Dorsal surface of 1 and 2 dark brown, a mid-dorsal stripe on 2, widened just posterior to the level of the yellow-tipped auricles, thereafter narrowed and confluent at its hind end with a transverse band which borders the entire width of the segment, yellow, auricles moderately prominent with 25-30 minute, posterior, black denticles; 3 largely orange but obscured with dull brownish at anterior end, the submedian transverse carina, an obliquely transverse ante-apical band and a longitudinal stripe on each side of the mid-dorsal carina uniting the former two, black; 4 orange each side for the anterior two-

sevenths of the segment's length, black from the submedian transverse carina as far caudad as a narrow, transverse, ante-apical, orange stripe, and with a slender, blackish prolongation forward on each side of the mid-dorsal carina almost to the anterior end of the segment; intersegmental articulations of 2-3, 3-4, 4-5 black; an inferior, longitudinal, brown stripe on each side of 3 and 4 for their entire lengths.

Legs: femora brown, superiorly reddish, tibiae and tarsi darker brown to black.

Wings (in addition to the features given at the beginning of this description): slightly brownish at the extreme bases of the subcostal and submedian spaces, venation dark brown or black except for the pale yellow costa, stigma pale ochre, surmounting  $5\frac{1}{2}$ -7 cells, 16 (right), 17 (left) antenodals on the front wings, the 1st and 6th thicker, 12 on the hind wings, 1st and 5th thicker, 11 (right), 12 (left) postnodals on the front wings, 13 (right), 14 (left) hind wings; one basal subcostal, one cubito-anal and one supratrangular cross-veins on all four wings, the cubito-anal nearly at the level of the first antenodal; post-triangular cells, front wings, two rows from the triangle out to the level of the point of separation of M1 and M3 (left) or one cell more remote (right), on the hind wings 3, then two rows to the level of the point of separation of M1 and M3 (left) or of M1 and the bridge of Rs (right). Hind wings with 4 paranal cells (Needham, 1944), of which the first two are also the proximal cells of the anal triangle and the fourth is also the first postanal; 5 postanal cells (Needham, 1944); sequence of cells between A1 and A2 behind the 2-celled anal loop: 1, 2, 3 (right), 2, 2, 4 (left), anal triangle 4-celled.

Dimensions: abdominal segments 1-4 13.5 mm., hind wing 28 mm., costal edge of stigma, front wing, 3.6 mm.

At least five species referred, or referable, to *Aphylla*, viz.: *brevipes* Selys, *dentata* Selys, *distinguenda* Campion, *edentata* Selys and *molossus* Bates Mss. Selys, are described as having the pale antehumeral stripe not connected with the pale mesothoracic "half collar;" in this respect the present male resembles them, but is smaller, has a shorter pterostigma and no pale humeral stripe; some other data concerning these five are given antea in the discussion of *Phyllocycla bartica*. The genitalia of the second abdominal segment of none of these five species have been described and owing to the absence of the last six abdominal segments and appendages of this specimen, it is not possible to say whether it is or is not conspecific with any of the five.

## ii. Gomphinae T. & F., 1940.

*Archaeogomphus hamatus* (Wllmsn., 1918).

*Agriogomphus hamatus* Williamson, 1918,

*Occas. Papers Mus. Zool. Univ. Mich.*, 59:4, pls. i, ii.

*Archaeogomphus hamatus* Williamson, 1919, op. cit., 63:5, pl. I, fig. 2; 1923, op. cit., 134:7.

Kartabo, 3 males, 1 female; two of the males without most of the abdomen, one male labeled 2.8.1919, another 6.III.1924, the remaining male and the female not dated.

In his paper of 1923 Williamson distinguishes *A. hamatus* female from *A. furcatus* female by the latter having the "rear of the occiput armed with two posteriorly directed spines or horns," while *hamatus* has the "rear of the occiput not armed with posteriorly directed horns." The present female has a horn .09 mm. long on each side of the occiput in the position in which rudiments are shown in his figure 10, pl. i of 1918 for *hamatus*. Since at least two of the present males are *hamatus* by the seminal vesicle (first joint of the penis), the principal character relied upon by its describer, I refer this female to the same species.

Distribution of *A. hamatus*: Dept. Magdalena, Colombia; British Guiana.

Of the thirteen features shown for *Archaeogomphus* in Prof. Needham's Verification Table for the neotropical Gomphinae (*Trans. Amer. Ent. Soc.*, 65:389, 1940) the following show deviations in these four individuals:

Postnodals in fore wings 6, without exception;

Antenodals in hind wings 9, without exception;

Postnodals in hind wings 5-7 (6 most frequent, in 5 wings out of 8);

Cross-veins between the sectors of the arculus proximal to the middle fork in fore wings 3-4 (4 more frequent, in 5 wings out of 8);

The same in hind wings 2, without exception;

Length of hind wing ♂ 15.5-17 mm., ♀ 18 mm.

The remaining seven features show no deviations in the present material.

AESHNINAE S. & H., 1850 (as Aeschnines).

i. Gynacanthaginae T. & F., 1940.

***Staurophlebia reticulata reticulata***  
(Burmeister, 1839).

E. M. Walker 1915, *Can. Ent.*, 47:390.

Rockstone, Essequibo, 9.04, Wm. Schaus, one female in the U. S. National Museum.

The colors of this female agree with the description of those from British Guiana given by Prof. Walker, t. c., p. 388. The venational features which he tabulated on page 389 show some variations in this female as follows: antecubitals, front wings, 34 (right), 33 (left), hind wings, 22 (r),

23 (l); postcubitals, front wings, 27 (r), 26 (l), hind wings, 28 (r), 30 (l); marginal cells between Rs and M3, front wings, 46 (r), 42 (l), hind wings, 49 (r), 47 (l); cross-veins in triangle, front wings, 6 (r), 7 (l), hind wings, 6 (r), 5 (l); cross-veins in supratriangle, front wing, 9, hind wings 7; cubital cross-veins, front wings, 8 (r), 9 (l), hind wings, 6 (r), 5 (l); cells in anal loop, hind wings, 21 (r), 18 (l); position of fork of Rs (number of first post-nodal cells before stigma, front wings, 9, hind wings, 11 (r), 12 (l). Abdomen exclusive of apps.) 70 mm., hind wing about 70 mm. (extreme apices broken).

To aid in determining the geographical distribution of the Guianan form of *Staurophlebia*, which Prof. Walker considered to be *S. reticulata reticulata*, I have re-examined the Honduras and Chiriqui males cited in the Biologia Centrali-Americana,<sup>36</sup> which presumably are duplicates of specimens in the René Martin collection in the Paris Museum. The Honduras male has a very narrow, reddish line representing the stem of the T-spot of the frons, a faint brown line on the fronto-nasal suture, thorax dull greenish with a narrow (linear) faint reddish-brown streak bordering the ante-alar sinus anteriorly and on each side of the mid-dorsal carina; abdomen faded, its anterior segments reddish-brown, inferior appendage one-half as long as the superiors, elongate, triangular, as shown in Prof. Walker's figure 2, page 396.

The Chiriqui male has a distinct, black, linear stem to the T-spot, a narrow dark brown line on the fronto-nasal suture and along the base of the labrum, thorax dull greenish, discolored in front of the ante-alar sinus, a narrow reddish-brown stripe on each side of the mid-dorsal carina, abdomen faded, its anterior segments reddish-brown, inferior appendage as in the Honduras male except that it is two-thirds as long as the superiors.

I have examined also two males of *Staurophlebia* from the Florida road in the forest near Guapiles, Costa Rica, one taken by myself June 4, 1909, the other by Messrs. Schaus and Barnes on June 5 or 6, 1909, and one female taken by Prof. F. Tristán and myself in forest north of Santa Cruz, Costa Rica, January 29, 1910. The first male has a reddish-brown linear stem to the T-spot, barely the suggestion of a line on the fronto-nasal suture, thorax green, no darker markings in front of the ante-alar sinus or along the mid-dorsal carina, green of the thorax continued caudad as far as the extreme base of abdominal segment 3, anterior half of 3 otherwise reddish-brown, inferior appendage reaching to .55 of the length of the superiors. The other Guapiles male was

<sup>36</sup> Neur., p. 179, 1905.



apparently similarly colored although the stem of the T-spot is still fainter, the thorax and first two abdominal segments more faded, the inferior appendage of the same extent. The Santa Cruz female is the only one of the three for which I have notes of the living colors; they are as follows: Eyes bright green with black pseudopupillae (6 horizontal rows in profile view, as follows from above downward: 2, 5, 6, 6, 5, 4, those of 2nd and 3rd row largest, decreasing in size from 3rd to 6th row). Remainder of head pale greenish-blue a rather faint pale brown T-spot on frons. Thorax and abdomen pale blue, the former a little grayish from pruinosity, abd. segments 1 & 2 and anterior half of 3 green. Thoracic sutures faintly brown. Abdominal intersegmental articulations dark brown, especially 7/8 and 8/9. Abdominal appendages brown, pale at base. Legs pale blue, tarsi and 3rd tibiae inferiorly black.

The Honduran and Costa Rican individuals thus approach Prof. Walker's *St. reticulata guatemalteca* more closely than either of the other two forms which he has differentiated; the Chiriqui male's living colors may have been such as to place it here also, although its present dried condition might seem to refer it to *St. reticulata obscura*.

René Martin<sup>37</sup> is the only author who has described and figured the inferior appendage of a *Staurophlebia* as "triangulaire conique du quart environ des supérieurs," although he adds "plus long chez certains sujets." Where this appendage is mentioned elsewhere in the literature, its length is given as half or more than half as long as the superiors, as it is in the four males mentioned above and in a male from Rockstone, British Guiana, which I received from Mr. E. B. Williamson. Prof. Walker has not discussed variations of the inferior appendage in his paper of 1915.

"The inferior appendage has a superior, basal, triangular process which projects upward and backward between the right and left superior appendages at their base; although well developed it is not mentioned in the descriptions; its morphological significance will, doubtless, be interesting."<sup>38</sup> It was subsequently described and figured by Prof. Walker (1915, pp. 392, 394, fig. 1), and by Navas for *St. platyura*.<sup>39</sup>

How it escaped the careful eye of E. Menger, artist of Martin's Aeschnines in the Catalogue of the Selys Collections, it is difficult to understand.<sup>40</sup>

<sup>37</sup> Cat. Coll. Zool. Selys-Longchamps, fasc. XX: 210, fig. 216, 1909.

<sup>38</sup> Biol. Centr. Amer. Neur. p. 178, 1905.

<sup>39</sup> Bol. Soc. Ent. Esp., 3: 91, fig. 1, "por encima". Mayo-Junio, 1920.

<sup>40</sup> A similar process exists on the inferior appendage of *Aeshna* (*Coryphaeschna*) *luteipennis* Burm. and has escaped description, although several times figured: Brauer, 1866. *Novara Reise Neurop.*, tab. I fig. 19 (as *Ae. exetisa*);

Geographical distribution of *S. reticulata reticulata*: Porto Cabello, Venezuela, the Guianas, Para and perhaps farther south in Brazil and Argentina.

### *Triacanthagyna* AND *Gynacantha*.

The identifications and the geographical distribution of the following species of these two genera are according to E. B. Williamson's paper of 1923 (*Univ. Mich. Mus. Zool. Misc. Publ. No. 9*) and that of Mr. W. D. Hincks of 1934 (*Entom. Record*, 46:77-81).

#### *Triacanthagyna septima* (Selys, 1857).

Kartabo: one male, "Odon. 83," abdomen lost; one male, abd. segs. 9-10 lost; one male, July-August, 1926, by Dr. Charles Hodge IV; Penal Settlement, 1917, one female, abd. segs. 6-10 lost. Georgetown, British Guiana, 15.3.1919, one female, appendages in part lost.

Anal loop with two vertical rows of cells in the hind wings of the three males and the left hind wing of the Georgetown female, with three vertical rows in the remaining three hind wings of the females; the second Kartabo male, however, has a central cell in the midst of the two vertical rows. There are three rows of cells between M4 and Msp1 of both front and hind wings of all five individuals. The anal triangle is 2-celled in the three males, except in the left hind wing of ♂ 83.

Distribution: Mexico to Bolivia and Rio de Janeiro, Brazil, including previous records from Dutch and French, but not British, Guiana; also Trinidad and Cuba.

#### *Triacanthagyna ditzleri* Williamson, 1923.

Georgetown, British Guiana, Broad Street, Head Office, 10.12.28. L. D. Cleare, Jr., one male in alcohol, lacking both left wings and abd. seg. 6, sup. apps. detached and at bottom of vial; sent by Prof. J. G. Needham.

Probable length of abdomen (excl. apps.) 35 mm., sup. apps. 5.56 mm., hind wing 33, costal edge of pterostigma, front wing, 3.35 mm.

Distribution: Guatemala to Mishuyacu, Peru, and Rio Grande do Sul, Brazil, including a record from Bartica, British Guiana (H. S. Parrish). Williamson, however, thought (l. c., p. 9) that the "similar but larger specimens from southern Brazil" which he referred to this species "will probably be found to be specifically distinct." Geijskes has reported *ditzleri* also from Trinidad, West Indies.<sup>41</sup>

Calvert, 1895, *Proc. Calif. Acad. Sci.*, (2) 1V, pl. XV fig. 27; Martin, 1908, Cat. Coll. Zool. Selys, fasc. XVIII, p. 74, fig. 72 (dorsal view); Navas, 1911, *Revista Mus. Paul.*, 8:480, fig. 3a (as *Remartinia barbiellina*). Calvert, 1941, *Ann. Ent. Soc. Amer.*, 34 (2): 393, fig. 1.

<sup>41</sup> Zool. Meded. Mus. Nat. Hist. Leiden, 15 (1-2): 99, 1932.

*Gynacantha tenuis* Martin, 1909.

Georgetown, British Guiana, one female.

Abdomen 45, hind wing 46, costal edge of perostigma, front wing, 3.60 mm.

Abdominal segment 10 in dorsal view 1.04 mm. long, 1.80 mm. wide; a shallow transverse groove at .36 of length of segment, interrupted mid-dorsally; anterior to this groove is a pair of low rounded elevations .24 × .42 mm., separated by a median depression .28 mm. wide; posterior to the transverse groove are two shallow smooth depressions each .28 × .60 mm., separated by a low mid-dorsal ridge, .24 wide, bearing short blackish hairs or fine lines; each of these depressions extends laterad to as far as the level of the lateral margin of the respective appendage. In the proximal anterior angle of each of these two depressions is a transversely elongated "crater," .19 × .25 mm., abutting on the mid-dorsal ridge just mentioned. Although these features of segment 10 are bilaterally symmetrical, it is doubtful whether they are specifically constant—some *T. septima* and *G. auricularis* are similar. The supra-anal tubercle (11th tergite) is .66 mm. long.

Anal loop separated from the hind margin of the wing by only one row of cells; the loop of three vertical rows of cells, except that the first transverse row of cells in the right hind wing consists of 4 cells, where there are but 3 cells in the left wing. Between M3 and M4 on all only one row of cells except where M4 makes a slight curve caudad, at which place there are two double cells on the right front wing, 1½ double cells on the right hind wing, one double cell on both left wings.

Distribution: Colombia to French Guiana and Putumayo district, Peru, including a single female from "Essequibo, British Guiana, Schneider," also two females from Chapada, Matto Grosso, Brazil. This species also has been recorded from Trinidad by Dr. Geijskes.<sup>42</sup>

*Gynacantha auricularis* Martin, 1909.

Kartabo: IV.4.1926, one male; V.8.1924, one male; V.12.1924, one male; VI.14.1924, one male; one female, not dated. Mt. Everard, Br. Guiana, one male.

The male of IV.4.1926 shows plainly a thin mid-ventral vertical plate between the right and left hamular processes and between the right and left spines of the anterior lamina but not reaching as far cephalad as the anterior end of the anterior lamina. This is the appressed "anterior parts" (Williamson) of the right and left hamular processes, and is well developed in *G. gracilis* and in *G. membranalis* (but not as strongly in *T. septima*), hence used by Williamson in his key (1923, p. 12) as one of the characters

separating *Triacanthagyna* from *Gynacantha*.

The most frequent condition of the anal loop is to have three vertical rows of cells in its anterior half and two vertical rows in its posterior half, but the three rows extend to the hind edge of the loop in the right hind wings of ♂ IV.4 and of the Mt. Everard ♂. In all six individuals the membranule of the hind wings is very narrow, its maximum width being only .14-.19 mm.

Distribution: Costa Rica to Chapada, Matto Grosso, Brazil, including a record from Bartica, British Guiana (H. S. Parrish).

*Gynacantha nervosa* Rambur, 1842.

Kartabo, V.17.1924, one female.

The anal loop has three vertical rows of cells, but in the left hind wing there is a transverse row of 4 cells at mid-height.

Distribution: California and Florida to Matto Grosso, Brazil (including a record from Rockstone, British Guiana—Williamson), Cuba, Haiti, Jamaica and Trinidad.

*Gynacantha gracilis* (Burmeister, 1839).

Kartabo: III.6.1926, one male; 2.VI.1921, one male, abd. segs. 4-10 lost; not dated, one male. Sixty m(iles) up Maroni R(iver), French Guiana, J 04, Wm Schaus, one teneral male, U. S. National Museum.

The prevalent tendency in these four males, is for the anal loop to have four vertical rows of cells (6 wings out of 8), but ♂ III.6. has both hind wings with three such rows except for one transverse row of four cells at mid-height, ♂ 2.VI. right hind wing, at one cell below the level of point of separation of Cu2 and A1, are three vertical rows, and in the undated male the right hind wing has three, then four, vertical rows.

The articular area between abdominal segments 1 and 2 in the Kartabo males is almost black around the body except at the genital fossa, but in the teneral Moroni River male this area is not black dorsally.

Distribution: Costa Rica to Bolivia and Rio de Janeiro, Brazil (including a record from Kartabo, British Guiana, October, 1920, W. T. M. Forbes).

*Gynacantha membranalis* Karsch, 1891.

Kartabo: 3.V.1924, one male; VI.9.1924, one female; VI.20.1924, one male; 11.7.1919, one male; undated, one male. Georgetown, British Guiana, one male.

The Kartabo, VI.20, and the Georgetown males are smaller than the dimensions given for this species in Williamson's paper of 1923, the hind wing being 53 mm. long in the former and 52 mm. in the latter. All my measurements of the superior male appendages of this material are lower than Williamson's, ranging from 5.4 to 5.81 mm., and

<sup>42</sup> 1932, paper above cited, p. 97.



some of those for costal margin of the stigma, front wing, are lower: 4.9 and 5.1 mm.

The anal loop of the hind wings of the five males has three vertical rows of cells throughout, except the left hind wing of ♂ 11.7. which has four vertical rows with three intermixed and the right hind wing three vertical rows in the anterior half, four such rows in the posterior half; both hind wings of the female have three vertical rows in the anterior half, four in the posterior half.

Distribution: Costa Rica to "Prov. del Sara," Bolivia, and Para, Brazil (including records from Bartica, H. S. Parrish, and Rockstone, E. B. Williamson, in British Guiana). Dr. Geijskes has reported this species from Trinidad.<sup>43</sup>

## ii. Aeshninae T. & F., 1940.

### *Coryphaeschna virens* (Rambur, 1842).

Kartabo: "Odon. 22," one female. R. Supenaam<sup>44</sup> British Guiana, September, 1930, G. Brinsley, one female, sent by Prof. J. G. Needham. Cayenne, French Guiana, Jan. 04, Wm. Schaus, one male, U. S. National Museum.

Distribution: Tamaulipas, Mexico, to Santa Cruz, Bolivia, Chapada, Matto Grosso, and the Amazons, Brazil; Cuba, Haiti and Trinidad.

### CORDULINAE Selys & Hagen, 1850 (as Cordulines).

#### Corduliinae T. & F., 1940.

### *Aeschnosoma peruviana* Cowley, 1934.

(Plate II, figs. 39-41, 43).

Cowley, 1934, *Stylops* 3 (4): 92-94.

Kartabo, 13.iii, one male, lacking abd. segs. 5-10 and the 2nd pair of legs.

Mr. Cowley has presented a description of, and a key to, the species of this genus, according to which the present male is *peruviana*. His description of *peruviana* was based on a single teneral female from "Peru: Rioja, Prov. Moyobamba, Dep. San Martin (Dr. P. Martin). . . . Rioja lies at an altitude of 848 metres between two tributaries of the Rio Mayo, itself a tributary of the Rio Huallaga."

From his description this male differs as follows: Frontal and dorsal parts of head dark metallic blue, not very brilliant. Right antenna 2.93 mm. long, left antenna broken. Thoracic pale markings present but indistinct, those on the meso- and metanotum more distinct, pale green. Coxal pale spots partly faded. Wings slightly smoky throughout, no yellow or other color at the bases,

membranule brown, reaching by a narrow prolongation to the anal angle, about 1.18 mm. beyond the apex of the 2-celled anal triangle; stigma dark brown, its costal edge on the front wing 2.13 mm.; antenodals on the front wings 15 (right), 14 (left); under the last costal antenodal on each front wing, but not actually in line with it, is a sub-costal antenodal placed slightly distad (right), distinctly proximad (left); arculus on all the wings proximal to the second antenodal by .24-.33 mm.; supratrangular cross-veins 3 on the front wings 1 (right), 2 (left) on the hind. Abd. segs. 1-4 13 mm., the pale spots on the segments are indistinct; hind wing 34 mm.

The small rounded auricles on abd. seg. 2 occupy about the anterior third of the lateral length of the segment; in ventral view each projects about .33 mm. beyond the surface of the segment; the accessory transverse carina of this segment, directed cephalad and ventrad, meets the auricle a little posterior to its antero-dorsal angle.

Genitalia of abd. seg. 2, profile view: anterior lamina hardly visible but bearing a tuft of hairs .7 mm. long; hamule hardly more prominent than genital lobe, its antero-posterior dimension .66 mm., its dorso-ventral dimension (penis not protruded) .42 mm., its most prominent part is the obtuse apex of the anterior (inner) branch; genital lobe wider (antero-posterior dimension .76 mm.) than high (dorso-ventral dimension .42 mm.), shape as shown in Pl. II, figs. 40, 41.

Supplementing the data on tibial carinae of Corduliinae given by Dr. St. Quentin,<sup>45</sup> the lengths of these carinae on the first and third legs, in mm. and in percentage of tibial length, are respectively (1) .71 mm., 20%, (3) 5.9 mm., 86%.

As Mr. Cowley points out, the presence of two cubito-anal cross-veins in the hind wings of *Ae. peruviana* necessitates an alteration in the statement of generic characters. A similar condition is found in the Malagassy genus *Libellulosoma* Martin, 1906, which that author placed next to *Aeschnosoma*, and in *Platycordulia* Williamson 1908<sup>46</sup> and *Neurocordulia* Selys<sup>46</sup> of North America.

The difference in the color of the frons of this male from that of the female type of *peruviana* is paralleled in *Ae. forcipula* Hagen. *Forcipula* is placed next to *peruviana* in Cowley's key; the length of its male hind wing (33-36 mm., Selys, 1871) is nearer to that of the present male than is that of the latter to the length of the hind wing of the type female of *peruviana* (38-39 mm.); however, the hind wing of *forcipula* female is given by de Selys as slightly

<sup>43</sup> 1932, loc. cit., p. 98.

<sup>44</sup> The Supenaam River is a left tributary of the Essequibo, near its mouth; see map, p. 24, of Beebe, Hartley & Howes, Tropical Wild Life in British Guiana, New York, 1917.

<sup>45</sup> *Zool. Anzeig.*, 121 (9-10): 225-239, 1938.

<sup>46</sup> *Ent. News*, 19 (9): 431, pl. xviii, 1908.

longer than that of *forcipula* male (35-37 vs. 33-36 mm.).

*Forcipula* is reported from Para, Ega and Sao Paulo in the Amazon valley, probably also Bahia (Selys, 1871) and Surinam (Martin, 1906, 1914<sup>47</sup>); *Ae. rustica* Selys from Bahia and Dutch Guiana (Martin, 1906, Cowley, 1934). If our identification of the present male be correct, the distribution of *peruviana* is Peru and British Guiana.

LIBELLULINAE Selys & Hagen, 1850 (as Libellulines).

The sequence of genera is according to Ris, Libellulinae, 1909-1919.

i. Libellulinae T. & F., 1940.

*Libellula herculea* Karsch, 1889.

Kartabo: VI.10, VI.12, 16.VI, all 1924, three females.

In a male from Cayenne, by Wm. Schaus, in the U. S. National Museum, abd. 32 mm., hind wing 40 mm., the pointed frontal tubercles, measured in dorsal view, project .09 mm. from the anterior surface of the frons; the corresponding rounded tubercles of the three females from Kartabo (abd. 31-34, hind wing 47-49) project .02-.05 mm.

Distribution: Vera Cruz, Mexico, to Cuenca, Ecuador, Iquitos, Peru, and Sapucay, Paraguay.

*Orthemis ferruginea* (Fabricius, 1775).

Kartabo: 30.VI.1924 and 11.7.1919, two males; three males numbered "Odon. 4, 85 and 105, and one female "Odon. 41."

Distribution: Florida, Texas and Arizona to Montevideo, Uruguay, Tucuman, Argentina (and Chile, Hagen, 1861), West Indies.

*Orthemis aequilibris* Calvert, 1909.

Kartabo: 5.V and 2.VI, both 1924, two females.

The vertex and frons of these two females approach the purple madder (of Smith's Explanation, pl. iv, fig. 7) and have a metallic violet reflection, but the reflection is not very brilliant; that of 2.VI is the brighter of the two. The same parts in the female from British Guiana by A. F. Porter, Jan. 18, 1912 (cited by Ris,<sup>48</sup> given to me by E. B. Williamson) are Roman sepia (Smith, l. c., fig. 38) with a metallic blue reflection. The female type of *aequilibris* from Paramaribo, undated (Acad. Nat. Sci. Phila. No. 9264), has the frons nearest burnt sienna (Smith, fig. 35), but somewhat duller, less vivid. The dated female paratype from Paramaribo (Dec. 18, 1904), and a third female of the same locality and date, not cited in the original description but marked at that time "faded-identif. doubt-

ful" have the frons a little darker than the pale brown of Smith (fig. 40).

Distribution: Valencia, Venezuela, to the Amazons.

*Orthemis biolleyi* Calvert, 1906.

Camaria, 27.VII.1920, one female.

The frons approximates the brown pink of Smith (fig. 21), the vertex is a little darker and has a slight metallic violet reflection. In this female and in that from British Guiana by A. F. Porter, Jan. 15, 1912, cited by Ris<sup>49</sup> and given to me by E. B. Williamson, the distal margin of the vulvar lamina is almost straight in ventral view. In the females of *O. ferruginea* and of *O. aequilibris* this margin is concave caudad in ventral view.

Distribution: Guatemala to Manaos, Brazil, and Iquitos, Peru.

*Orthemis cultriformis* Calvert, 1899.

Kartabo: 11.VI.1921, one male, abd. segs. 6-10 lacking.

Distribution: Chiriqui, Panama, to Agamo, Ecuador, Mishuyacu, Peru, and San Isidro near Buenos Aires.

ii. Diastatopidinae T. & F., 1940.

*Diastatops*.

Identifications and geographical distribution according to Prof. B. E. Montgomery, *Lloydia*, 3: 213-280, 1940. "The known distribution of *Diastatops* extends from the lower Magdalena (Sevilla, Colombia) and Orinoco (Cano d'Vagre, Venezuela) basins to the lower Parana basin (Sta. Fe, Argentina)," Montgomery, p. 221.

*Diastatops pullata* (Burmeister, 1839).

Montgomery, 1940, p. 238.

G(eorgetown): one specimen, head and abdomen lost.

The "light area" of the wings is not at all conspicuous and is hardly paler than the distal brown.

Distribution: The Guianas to Matto Grosso, Brazil, and eastern Peru.

*Diastatops obscura* (Fabricius, 1775).

Montgomery, 1940, p. 249, pl. III, figs. 1-3.

Kartabo: one male "Odon. 23," abd. segs. 5-10 lost; one male "Odon. 51," head, abd. seg. 10 and apps. lost.

Prof. Montgomery says, p. 251, of this species: "Cephalic surface of anterior lamina [of male] smooth." Both these males, under Zeiss binocular, oc. 4, obj. a<sub>0</sub>, show minute spinules here, which are still more evident under a Leitz compound microscope, oc. 10 ×, obj. 3, in this case used with the lower lens of the objective removed; these spinules are about .009 mm. long.

<sup>47</sup> Cat. Coll. Selys-Longchamps, fasc. xvii, pp. 57, 60, 1906; Gen. Insect., 155, p. 14, 1914.

<sup>48</sup> Cat. Coll. Zool. Selys, fasc. 16 (2): 1103, 1919.

<sup>49</sup> For Camaria, on the Cuyuni River, see M. B. & C. W. Beebe, Our Search for a Wilderness, New York, 1910, pp. 248-250.



Distribution: Colombia and Guiana to Paraguay and Bolivia.

***Diastatops dimidiata* (Linnaeus, 1758).**

Montgomery, 1940, p. 257.

Kartabo: 3.VI.1924, one male; 8.VI.1924, one male, abd. segs. 7-10 lost; 11.VI.1924, one male, abd. segs. 5-10 lost; not dated, two males, abd. segs. 4-10 and 6-10 lost respectively.

St. Laurent, Maroni River, French Guiana, March, one teneral female, coll. Wm. Schaus, U. S. National Museum.

Tendencies to form more densely reticulated areas are visible in the post-triangular area of both front and hind wings, between Cu1 and Cu2 near their origins and in the anal loop of the hind wings.

Distribution: Venezuela and the Guianas to Para (Brazil).

***Zenithoptera fasciata* (Linnaeus, 1758).**

(Plate II, fig. 42).

1. Kartabo: "Odon. 53," one specimen, abdomen lost. 2. Hoorie:<sup>50</sup> "Odon. 16," one specimen, abdomen lost.

With these two specimens I have compared the following material:

3. Cayenne, French Guiana, Dec. 03, one male.

4, 5. Hermina Falls, Maroni River, Surinam, Aug., one male, one female.

6. Surinam River, one male. Nos. 3-6, coll. Wm. Schaus, U. S. National Museum.

7-9. Guinipa (error for Guanipa) River,<sup>51</sup> Ven[e]zuela, Feb., 1911, S. Brown, two males, one female (male 7 lacks the head, male 8 abd. segs. 5-10).

10. Para, 21.10.92. ex Selys coll., one male.

11, 12. Brazil, two males, with labels "Palp. americana L" in Hagen's handwriting and printed labels "Mus. Berol." "From P. R. Uhler's coll." and "Coll. of P. P. Calvert."

13-23. Rumococha, Rio Amazonas, near Iquitos, Aug. 1939, José Schunke, through Mr. Joseph Hocking.

24. Costa Aguaray, Paraguay, one male, ex coll. Foerster.

Nos. 7-24 are in the Academy of Natural Sciences of Philadelphia.

Nos. 1-10, 12-23 have five yellow, lateral, thoracic stripes and are, therefore, the *Zenithoptera americana* of Ris, 1910.<sup>52</sup> No. 24 has two orange, lateral, thoracic bands, occupying almost all of the mes- and metepimera respectively—hence as in Ris's *viola*—but also a mesepisternal, distinctly antehumeral, orange stripe, .33 mm. wide at mid-

height, parallel to and distant .7 mm. from the mid-dorsal carina, .47 mm. distant at its upper end and .85 mm. distant at mid-height from the humeral suture, not quite attaining the ante-alar sinus above; this stripe is not mentioned by Ris for *viola* and is decidedly more anterior than the first of the five stripes of his *americana*. This male, No. 24, was labeled by Foerster "Z. fasciata? an americana, an subspecies nova?"; it agrees with the description of *Z. lanei* recently published by Dr. N. Dias dos Santos<sup>53</sup> except for some neuration details which I do not believe to be significant.

No. 11 is much faded so that the thoracic markings are not visible. No. 12 has a distinct yellow antehumeral stripe in the same position as the red antehumeral of No. 24. Traces of ill-defined antehumeral red are visible on Nos. 2, 7-9, 13-18, 20 and 21.

The range of size of specimens Nos. 1-23 is abdomen ♂ 14-17 mm., ♀ 14, hind wing ♂ 19-24, ♀ 22-23; in the eleven males from Rumococha the range is abd. 14.0-16.0, hind wing 21-23.5 mm. The largest male is that from Surinam River, the Cayenne male is almost as large, the smallest is from Rumococha, but the mutilated Brazil males (Nos. 11 and 12) have the hind wing 19.5 and 19 mm. The Kartabo and Hoorie specimens (Nos. 1 and 2) have the hind wing 23 and 21.5 mm. respectively.

The width of the white postnodal band, as measured on the right front wing, between veins M1 and M2, varies from 1.10 (Para) to 2.17 (Kartabo) mm.; in the Rumococha series from 1.32 to 1.89 mm., but is not correlated with wing-length. In the Hoorie specimen it is 1.74 mm. wide.

The maximum width of the pale apical or ante-apical spot, measured in the long axis of the wing, varies from 0 (one Guanipa River, Para, one Rumococha, No. 22) to 1.87 mm. (Brazil No. 11). In the first six Rumococha males (Nos. 13-18) its width is 1.18-1.46 mm. and it is separated from the apex by brown which is as wide as the pale spot; in four other Rumococha males (exclusive of No. 22) its width is .3-3.71 mm. and it is situated at the wing apex with no marginal brown; the collector of the Rumococha series gave one number to specimens 13-18, another to Nos. 19-23. In the Kartabo and Hoorie specimens the width of the white postnodal band and of the apical pale spot is 1.27 and .60 mm., respectively, with no marginal brown.

The width of the external branch of the genital hamule varies from .34 (No. 12) to .47 (Nos. 4, 6, 17, 20) mm., and hence is not correlated with locality; the ventral margin of this branch varies from nearly straight to strongly convex, but again is not characteristic geographically. On comparing

<sup>50</sup> For the location of Hoorie, on the Barama River, British Guiana, see "Our Search for a Wilderness" by M. B. & C. W. Beebe, New York, 1910, map, page 110.

<sup>51</sup> See Stone, W., *Proc. Acad. Nat. Sci. Phila.*, lxxv:189, 1913. The altitude is 0-200 m., the mouth in the Golfo de Paria, 10° N., 62° 20' W.

<sup>52</sup> Cat. Coll. Selys-Longch., fasc. XI:312, 1910.

<sup>53</sup> *Revista Brasil. Biol.*, 1 (2):207, figs. 1-12, Rio de Janeiro, Junho, 1941.

the extruded penes of Nos. 3 (Cayenne), 11 ("Brazil") and 24 (Costa Aguaray), I find no difference.

In profile view, the inferior margin of the male superior appendages is armed with a row of denticles, one of which is usually larger than the others and may consequently be described as a tooth; the position of this tooth varies from one-half to two-thirds of the appendage-length and again is not correlated with locality. In the Rumococha series, however, a correlation between the position of this tooth and the wing markings appears: males Nos. 13-18, which have the pale *ante*-apical spot, have this tooth at 64-68% of the appendage-length, while Nos. 19-23 with the pale spot at the *apex*, or absent, have the tooth at 50-55% of the appendage-length. Nos. 12 and 24 have the tooth at 67%, No. 10 at 57%, Nos. 6 and 7 at 50% of the appendage length.

For his *americana*, Ris (1910) gives as a female character "im Hinterflügel eine longitudinale, oft nicht complete Aufhellung von A3 bis in die Mitte des Discoidalfeldes," with no mention of the male in this respect. For his *viola* (1910) he states of the eight males he examined: "Alle Exemplare mit longitudinale Aufhellung in Hinterflügel wie das ♀ *americana*." At that time the female of *viola* was unknown to him. In 1919, from a larger series of *viola*, he figured both sexes with the "Aufhellung" on the hind wings. It is also to be noted that his 1910 figure. 173 ter, showing the Aufhellung on the hind wing, is labeled "*americana* ♂."

Of the present material, in which at least the base of the abdomen is preserved, Nos. 4, 5, 6, 7, 8, 9, 11 and 12 have the "Aufhellung" well developed, No. 3 has it feebly indicated, in Nos. 10 and 24 it is absent. It would appear, therefore, that the presence or absence of this "Aufhellung" is not a sexual character in *Zenithoptera* and that it is impossible to determine the sex of specimens 1 and 2.

Distribution of *fasciata* L.: Pacific slopes of Colombia from less than 200 meters elevation to Trinidad and the Guianas, the Amazon from Para to Umbria, Colombia, and Balsapuerto, Peru.

Montgomery (*Lloydia*, 3:233, 1940) has reported *Zenithoptera*, without particulars, from Nicaragua.

#### THE TYPES OF THE LINNAEAN SPECIES OF *Zenithoptera*.

The specific status of the forms of *Zenithoptera* was discussed by Ris (1910, 1919), but he was not able to examine George Edwards' "A Natural History of Birds" (Part IV, 1751) on which the Linnaean names are based. I have studied a copy in the library of the Academy of Natural Sci-

ences of Philadelphia and present my results.

In the *Systema Naturae*, edit. X, p. 545 (1758), Linnaeus named two "species" now in question. His full statements are as follows:

"*fasciata*. 12. L. alis planis fuscis: fascia alba lineari. *Edw. av.* 174, t. 174. *Habitat in India. DeGeer.*"

"*americana*. 16. L. alis purpurascens: fascia alba, primoribus apice albis; posticis linea baseos alba. *Edw. av.* 174, t. 174. *Habitat in America. Corpus viride. Alae fusco-purpurascens.*"

Edition XII of the *Systema*, "reformatum," 1767, pp. 903 and 904 respectively, has the same statements except that for *fasciata* has "*av.*" for "*aw.*" and that for *americana* has "*Edv.*" for "*Edw.*"

It will be noted that Linnaeus refers to the same plate in Edwards' work for these two species. Edwards' plate 174 contains only two figures: one is of a bird, The Lory Parrakeet, the other is of a "Fly," a photograph of which is here reproduced as our figure 42, Plate II. Linnaeus does not refer to any specimens of either *fasciata* or of *americana* which he may have seen. It would appear, therefore, that each of these specific names is based solely upon one and the same figure and that *americana* was from the very start a synonym of *fasciata*. There is no basis for a suggestion that reference to some other plate in Edwards' work was intended by Linnaeus in one or other of his two species, as an examination of all of Edwards' plates fails to show any other than his 174 to which the Linnaean descriptions could refer. Since only one figure by Edwards is concerned, Ris' 1910 (p. 315) suggestion that *fasciata* Linnaeus might be the same as *tullia* Drury has no standing.

How did Linnaeus arrive at the idea of two species? I can only suggest that he may have seen, in 1758 or earlier, the specimen which his compatriot, DeGeer, later described and figured in 1773 (*Mem. Hist. Ins.*, III:559, pl. 26, fig. 7) as *Libellula violacea* and of which DeGeer then wrote "que je crois originaire des Indes," and on that basis added to his description of *fasciata* "Habitat in India. DeGeer." On difference in habitat, Linnaeus may have separated his *americana* from his *fasciata*, but the basis for the two "species" still remains one and the same figure of Edwards. DeGeer placed *fasciata* Linn. as a synonym of his own *violacea* and subsequent writers have followed him except in recognizing the priority of Linnaeus's name. Sjöstedt has this note on DeGeer's type: "DeGeer's *Lib. violacea* (*Mem. Ins.* III, p. 559, No. 6 t. 26, fig. 7, 1773) deren Typus vorliegt, ist mit *americana* L. (Ris, o. c.), nicht mit *viola* Ris identisch. Auf der Etiquette des erwähn-



ten Typus in DeGeer's hier im Stockholmer Reichsmuseum aufbewahrter Typus-Sammlung seiner Memoiren steht: '6 *L. violacea* D. G.-L. *fasciata* L., p. 559' " (*Arkiv för Zoologi*, 11 (15) : 40. 1918).

Edwards' description of the insect is as follows (p. 174): "The Fly engraved on this Plate has the Head and body of a dull Green; the wings are of a dirty purplish Brown, with some transparent Spots in them. I drew it from Nature, but forgot to note from whence it was brought; but I think it was from the *West-Indies*." On page 26 of his Part I, Edwards says: "I do not pretend to have any Skill in the Description of Insects, not having at all study'd them; nor do I know the Terms by which their Parts are distinguished: But they being no Part of my Design, I have added them only as Decorations to fill up some void spaces in the Plates where the Birds were small, so that if my Descriptions are obscure, I hope the Justness of the Figures will help to clear them." Pages 236-243 of Edwards' Part IV are occupied by "A Catalogue of the Names of all the Birds, Beasts, &c. contained in the four Parts of this *Natural History*, ranged in a *Generical Order*;" insects are on pages 242-243 and among them are "Flies with very long Bodies, and four pretty long Wings, that fly swiftly over watery Places, vulgarly call'd with us *Horse-flies*, or *Horse-stingers*. The green Horse-fly 112 The purple and brown Horse-fly 174." [Incidentally, The green Horse-fly 112, in Edwards' Part III, 1750, is *Neurobasis chinensis* (Linn.).]

No information is afforded by Edwards' figure or description as to stripes or bands on the thorax, nor are the abdominal appendages sufficiently distinct to determine the sex; the wings agree better with Ris' photographs of his *viola* than of *americana*.

Hagen has a two-page article, "Die Neuroptera der Linneischen Sammlung" (Stett. Ent. Zeit., 6:155-156, 1845), in which the following statements occur: "Hr. Buchhändler Dr. J. R. Schulz in London hat auf meine Bitte die Güte gehabt, an Ort und Stelle die noch vorhandenen Arten zu notiren. Seiner gefälligen Mittheilung verdanke ich folgende Bemerkungen: In Linne's eigenem Exemplar der ed. XII der Syst. naturae sind folgende Arten mit Tinte von Linne unterstrichen und sämmtlich noch vorhanden. Die Etiquetten sind nach der Anspruch des Herrn Richard Hippist, Sekretair der Linnean Society, ebenfalls sicher von Linne's eigener Hand." [There follows a list, names only of 33 species, 14 of which are *Libellula*, but not including *fasciata* or *americana*.] Hagen's article continues: "Ausserdem sind in selben Buche mit Bleifeder unterstrichen und mit Etiquetten, welche wahrscheinlich vom Käufer der Linne'schen Sammlung, Herrn Smith her-

rühren und den gelegentlich Zusatz: E description Linn. führen, noch folgende 17 Arten vorhanden: *Libellula fasciata* [and 16 species of non-Odonata]. . . . Leider konnte ich über die Insekten selbst keine nähere Auskunft erhalten." This specimen of *fasciata*, marked in Linnaeus' copy of the 12th edition of the *Systema Naturae* (1767), may or may not have been in Linnaeus' hands when the 10th edition was published (1758).

Summing up, like Ris, Erichson, Rambur and Burmeister, I consider Linnaeus' *fasciata* and *americana* to be one and the same species, but unlike Ris—although in agreement with Erichson and Rambur—I use *fasciata* as the specific name by reason of its priority over *americana* on page 545 of the 10th edition of the *Systema Naturae*.

Ris (1910, p. 313) has briefly discussed also the justifiability of the acceptance of the generic name *Zenithoptera* Bates in Selys (1869) in preference to that of *Potamothemis* Kirby (1889), on the ground of insufficiency of de Selys' characterization. As de Selys' two statements are not generally accessible, they are reproduced here.

"Quant aux deux Palpopleura de l'Amérique méridionale à peine distinctes l'une de l'autre: *P. americana* L. et *fasciata* F. [sic] (*violacea* De Geer) elles ont un faciès tout différent, leur abdomen est grêle et selon M. Bates elles portent comme les Agrion les ailes relevées dans le repos. Il convient d'adopter pour elles le genre *Zenithoptera* proposé pour elles par le célèbre voyageur dans les notes manuscrites qu'il m'a gracieusement adressées, lorsqu'il m'a cédé sa riche collection d'Odonates de l'Amazonie." (Recherches sur la faune de Madagascar et ses Dépendances, d'après les découvertes de François P. L. Pollen et D. C. Van Dam. 5me partie, 1re livraison, pp. 15-16. Leyde, Steenhoff, 1869).

"*Palpopleura*, Ramb. — Presque exclusivement africain; une seule espèce aberrante (*P. sexmaculata* Fab.) est asiatique. *L'Americana* a formé le G. *Zenithoptera*, Bates." (Assoc. Française Avanc. Science, 10e Session 1881, p. 667. 1882).

After Karsch (Berlin. Ent. Ztschr. 33 (2) p. 355, 1890) had pointed out the identity of Kirby's *Potamothemis* with Bates' *Zenithoptera*, Kirby placed his *Potamothemis* as a synonym of *Zenithoptera* (Cf. Kirby, Cat. Odon., pp. 9 and 178, 1890) and used *Zenithoptera* in his paper in the *Annals and Magazine of Natural History* (6) 19:602, 1897.

*Perithemis thais* Kirby, 1889.

Kirby, 1889, *Trans. Zool. Soc. Lond.*, 12 (9):324.

Ris, 1930, *Misc. Publ. Univ. Mich. Mus. Zool.*, 21:38.

Kartabo, one specimen, abdomen lost, 20.X (?) .1920; one male, undated.

The male has the triangle of the right front wing and of both hind wings 2-celled, of the left front wing free, internal triangle of both front wings 3-celled; discoidal (post-triangular) cells on the right front wing 3, then 2 rows to beyond the level of the nodus, then 3 rows increasing to 6 marginal cells; on the left front wing they are 3.2.2.3, then 2 rows to beyond the level of the nodus, followed by 3 rows increasing to 5 marginal cells; there is 1 (right) and 2 (left) single cells reaching from M4 to Cu1 on the hind wings. The black markings of the abdomen and the brown markings on the wings are as in Kirby's original description of 1889, except that there is no brown border at the tip of the hind wings.

The dated specimen has the triangles of both front wings free, of both hind wings and the internal triangle of both front wings 2-celled; the post-triangular cells of the front wings are: (right) 2.2.2.3.3.2, then 3 rows increasing to 7 marginal cells, (left) 3.2.2.3.2.3.3.2, then 3 rows increasing to 6 marginal cells; there is a single cell reaching from M4 to Cu1 on both hind wings. The brown bands on the wings are greatly reduced and paler than in the male, that at the triangle of the hind wings broken into two clouds, one at the triangle, the other behind Cu2-A1, the ultra-nodal bands of all wings very tenuous at M3.

Distribution: Recorded by Ris (1930) from Trinidad to the Amazons and Matto Grosso, and by Snhr. Dias dos Santos (1944) from Ilha Seca, São Paulo.

### iii. *Brachydiplacinae* T. & F., 1940.

#### *Fylgia amazonica* Kirby, 1889.

Kalacoon, Bartica District, one specimen, Odon. 111, lacking head and abdomen.

This specimen is probably a female since the only coloring on the wings is a slight smoky trace in the most proximal row of cells along the anal margin of the hind wings. I have compared this specimen, as far as its mutilated condition permits, with a male from Para, Dec. 26, 1892, by Schultz, given to me by Baron E. de Selys-Longchamps, with which it agrees.

Distribution: The Guianas, Para.

#### *Oligoclada pachystigma* Karsch, 1890.

Borrer, 1931, *Misc. Publ. Univ. Mich. Mus. Zool.*, 22:24, figs.

Kartabo, one male, 2.VI.1921; one male, VrS, Odon. 56; one male, LAMA 17, Odon. 39, abd. segs. 6-10 lost.

The occiput in male 56 is intermediate between Borrer's figures 48 and 49, the spines very acute; in male 39 and the dated male it is like his figure 51, but wider posteriorly and without spines.

Distribution: Orinoco Venezuela, the

Guianas, Amazon and Madeira valleys from Para to Porto Velho, Rio Sao Lourenço in Matto Grosso (Borrer).

#### *Oligoclada raineyi* Ris, 1919.

(Plate II, fig. 37).

Ris, 1919, *Cat. Coll. Zool. Selys-Longch.*, fasc. 16 (2): 1134.

Borrer, 1931, *Misc. Publ. Univ. Mich. Mus. Zool.*, 22:34.

Kartabo, 20.V.1924, one female.

The female of this species has not been described hitherto. The present individual agrees so well with the described males in all but sexual characters that I do not hesitate to refer it to this species. It falls at once into the nearest rubrics for *raineyi* in the keys of Ris (l. c., p. 1132) and of Borrer (l. c., pp. 16-17).

The only differences detected between the venation of this female and Ris' figure 650 of that of a male from Tumatumari, British Guiana, are: antenodals  $9\frac{1}{2}$ \*<sup>54</sup> on both front wings, 9 (right), 8 (left) postnodals\* in the hind wings, one row of 6 (right front and hind wings) or 5 (left front and hind wings) cells between Rs and Rspl, 2 rows of post-triangular cells from the triangle out for 4 cells, followed by 3 rows for at least 4 cells in both front wings (beyond this point the wings are torn); the single row between M4 and Cu1 on the hind wings for 2 cells only, thence increasing; cells bordering the proximal side of the bisector of the anal loop (A2 of Ris and of Borrer) 7 (right), 8 (left\*) hind wing; the anal margin of both hind wings, proximal to A3, is torn so that an exact count of rows of cells can not be made, but enough remains to show that no great difference here from Ris' figure can have existed.

Following are other features of this female: Vertex brown ochre;<sup>55</sup> frons anteriorly nearest cadmium yellow,<sup>55</sup> above darker brown, with a metallic blue reflection; clypeus pale blue-green;<sup>55</sup> labrum blue-green at base, becoming brown distad and finally black along the free margin; labium near gamboge,<sup>55</sup> "with a median band of black as wide as ligula proximally and narrowing to" (Borrer) .28 mm. distally. Occiput burnt sienna,<sup>55</sup> darker in the center, triangular in dorsal view with a pair of finger-like projections on the caudal margin, similar to Borrer's figure 50 for *O. pachystigma*, but each directed laterad, not at all caudad.

Hind lobe of prothorax 1.65 mm. wide in dorsal view, slightly wider than any other part of that segment, bilobed, with a row of marginal gray hairs up to .94 mm. long.

Pterothorax bluish-pruinose with some metallic reflection on the sides. Legs black-

<sup>54</sup> The differences here marked with an asterisk fall within the range of variation for *raineyi* as given by Borrer.

<sup>55</sup> Of Smith's "Explanation of Terms used in Entomology," 1906, pl. 1V.



ish, first femora pale brown inferiorly in the proximal half, third femora 5.4 mm. long, with 15 spines in the outer (anterior) row, increasing in length distad, last spine nearly twice as long as the penult; following the last spine is a shorter hair or slender spine; 13 more slender spines in the inner (posterior) row; between these two rows, but much nearer to the inner row, is a ventral row of 6 (left femur) — 9 (right femur) spines shorter than, but equally stout as, those of the outer row. Only the merest hint of a tooth on the tarsal claws and even that not visible on all claws.

Abdomen narrowing slightly from 2-8, more abruptly on 9-10, a distinct additional transverse carina on the anterior half of 3 and 4; indian red<sup>55</sup> dorsally, margins of 8 and all of 9 and 10 blackish; ventral surface darker red, lateral margins and a spot at each postero-lateral angle of 5-8 and sternite of 8 blackish.

Vulvar lamina not projecting caudad as far as the level of the hind tergal margin of 8, its free margin bilobed, its anterior margin defined by a low transverse carina which, in ventral view, is convex anteriorly (Pl. II, fig. 37).

Appendages .19 mm. long, straight, a little longer than 10, and than the anal tubercle (tergite of 11) between them.

Abdomen 13.5, hind wing 20 mm.

Distribution: British Guiana, Surinam, Para (Borror).

#### *Uracis imbuta* (Burmeister, 1839).

Calvert, 1906, 1907, Biol. Centr.-Amer. Neur.: 218, 402.

Ris, 1911, 1919, Cat. Coll. Zool. Selys-Longch., fasc. XII: 411, 419; fasc. XVI (2): 1139, figs. 657, 658 (venation).

British Guiana: Kartabo, eight males, six females, four specimens lacking abdomen, eight of them dated March 1-11, 1926, June 1, 1921, June 3, 1924, June 8 and 16, 1920, July-Aug., 1926 (Dr. C. Hodge IV); those not dated numbered Odon. 48, 74, 89, 117, 123, VRS Odon. 20 and 30. Kaieteur, Feb. 2, 1921, one male, abd. segs. 5-10 lost. Essequibo River below [between?] mouths of Potaro and Rupinuni Rivers, May, 1920 (Geo. B. Fox), one female (Acad. Nat. Sci. Phila.).

French Guiana: Cayenne, June, one female; 60 m(iles) up Maroni River, 8.04, one male; St. Laurent, Maroni, March, one male, two females (all by Dr. Wm. Schaus, U. S. Nat. Mus.).

The female from the Essequibo River has the proximal side of the triangle of the hind wings distal to the arculus; the anal field of the same wings between A3 and the anal margin has at base 4 rows of cells, but in its distal half only 3 rows, decreasing to 2 rows and then 1 cell.

Of the 20 individuals from British Guiana, 8 (=40%) have the proximal side of the triangle of the hind wings at the arculus, the remainder have it more distal. Of the 5 individuals from French Guiana, the 3 females have this side at the arculus or very slightly distal, the 2 males more distal. Of the 11 males, 7 females tabulated for taxonomic characters for the Biologia Centrali-Americana, 15 of the 36 hind wings (=41.7%)<sup>56</sup> had the proximal side of the triangle of the hind wings at the arculus, the remainder more distal. The B. C.-A. material of *imbuta* studied was a much less homogeneous group, geographically, than that here recorded from British Guiana, as it extended from the Isthmus of Tehuantepec to Venezuela and included 3 males and 3 females as the largest number of individuals from any one lot (i.e., the indefinite locality "Panama" M. C. Z.). Of other species of *Uracis*, tabulated at the same time as the B. C.-A. *imbuta*, and which appear in the *Annals of the Carnegie Museum*, 6 (1): 227-229: *siemensi* 1 male, *ovata* 1 male, 3 females,<sup>57</sup> *infumata* 2 males, *fastigiata* 17 males, 7 females (including those of this last species in the B. C.-A.)—all had the proximal side of the same triangle distal to the arculus.

These facts suggest that the fewer individuals of *imbuta* with the proximal side of the triangle of the hind wings at the arculus represent a more primitive state for this genus, while those *imbuta* with the distally placed proximal side of the triangle, and also the other species of this genus, display a more specialized condition. This view is strengthened by the fact that *imbuta* has the triangle of the front wings placed more nearly at 90 degrees with the supratriangle, while the other species have that triangle more obliquely placed, as Ris pointed out (1911, pp. 410-411). This interpretation of the positions of the proximal side of the triangle of the hind wings in *Uracis* as primitive and as specialized is a contradiction to the recession of the triangle as set forth by Prof. Needham<sup>58</sup> and perhaps not in harmony with Col. Fraser's ideas<sup>59</sup> as to this triangle. Neither of these authors deals with the obliquity of the triangle of the front wing in this connection and the question involves the relationship of *Uracis* to other genera, briefly touched on by Ris (1911, p. 409). A similar obliquity in a much less densely veined wing occurs in *Brachygonia oculata* of Borneo (Ris, fasc. XI, p. 352, 1910).

I have not found any other features (color, venation, genitalia of the second abdom-

<sup>56</sup> These data have not been published hitherto.

<sup>57</sup> *Ovata* is referred to *infumata* by Ris, 1911, p. 414.

<sup>58</sup> *Proc. U. S. Nat. Mus.*, 26 (1331): 721, 1903.

<sup>59</sup> *Australian Zoologist*, 9 (4): 393 and 394, 1940, under Brachydiplacinae and Onychotheminae, respectively.

inal segment or appendages of the male, vulvar lamina) correlated with these differences in the position of the triangle of the hind wings of *Uracis*.

Distribution of *U. imbuta*: Mexico to Buenos Aires, Trinidad.

***Uracis ovipositrrix* Calvert, 1909.**

Kartabo, III.4.1926, one male; one specimen, not dated, abdomen lost, possibly a female because the brown at the apex of the wings has the centres of the cells paler and the hind wings, between A3 and the anal margin, have 4 rows of cells for 4 cells, then 2 rows almost to the apex of the anal loop, while the male, in the same area, has 4 rows, followed by 3 rows almost to the apex of the anal loop.

Distribution: British Guiana, including Mt. Roraima, Surinam, the Amazons from Santarem to Iquitos; Matto Grosso.

***Uracis infumata* Rambur, 1842.**

British Guiana: Waratuk, 19.ii.1921, one female.

Distribution: British Guiana, Cayenne, Para, Fonte Boa, Bahia and Matto Grosso, Brazil; Mishuyacu, Peru.

***Uracis fastigiata* (Burmeister, 1839).**

Kartabo, I.VIII.1920, one male, abd. segs. 5-10 lost; IV.1.192?, one female.

Hind wing, male, 34 mm., female, 29.5 mm. The last antenodal of both front wings of the female is united with the penult antenodal at an oblique angle at the subcosta; it is more slender than the other antenodals.

Distribution: Mexico to Yumbatos, Peru, east to Trinidad, Bahia and Matto Grosso.

***Micrathyria spinifera* Calvert, 1909.**

Kartabo, 22.II.24, one male.

Distribution: Subsequent to its original description from Surinam, this species has been recorded by Ris (1911) from Para, Villanova and Obidos, all in the Amazon valley, where it was first taken by Henry Walter Bates.

***Micrathyria eximia* Kirby, 1897.**

Kirby, 1897, *Ann. Mag. Nat. Hist.*, (6) 19:609, pl. xiii, fig. 4 (not 3) (body and left wings).

Ris, 1911, *Cat. Coll. Zool. Selys-Longch.*, fasc. XII:450, figs. 285, 286 (apps. ♂).

Kartabo, 20.VI.1924, one specimen (female?), abdomen and the posterior part of the right hind wing proximal to the bisector of the anal loop and as far forward as the anal vein, lacking.

The venation differs from that of *Oligoclada* in the presence of two bridge cross-veins on all four wings, in this respect resembling *Fylgia*, *Nephepeltia*, *Edonis* and *Micrathyria* as figured by Ris (*t.c.*, pp. 391,

393, 395, 397, 426, 449). It differs from *Fylgia*, *Nephepeltia* and *Edonis* in showing not the slightest trace of breaking in the costal side of the triangle of the front wings; from *Edonis* also in having a maximum of only 2 rows of cells between A3 of Ris and the anal margin of the left hind wing.

In Ris' key to the species of *Micrathyria* (1911, pp. 426-429), this specimen falls under rubrics E (except that the arculus is very close to the second antenodal in both front and the right hind wings and at that antenodal in the left hind wing instead of "ungefähr in der Mitte zwischen 1. und 2. Anq.") *ee* and *εε*. These exceptions from E are also found in the following *eximiae* in the Academy of Natural Sciences of Philadelphia: Chapada, Matto Grosso, two males, one of which lacks the left front wing, and Puerto Barrios, Guatemala, one male, in which the arculus is near the second antenodal on the front wings and at the second antenodal on the hind wings. Kirby's original figure of *eximia* shows the arculus between antenodals 1 and 2 but nearer to 2 on both front and hind wings. In the David female shown in fig. 30, tab. 9, *Biologia Centrali-Americana*, Neuroptera, the front wing has the arculus slightly proximal to the second antenodal, the hind wing a little distal to the second antenodal.

Distribution: Guatemala to Santa Catarina, Brazil.

iv. Sympetrinae T. & F., 1940.

***Erythrodiplax* Brauer, 1868.**

The following identifications and statements of geographical distribution are based on the recent excellent Revision<sup>60</sup> of the genus by Dr. Donald G. Borror. As stated in its preface: "In this revision of the genus the fundamental criteria of species have been the characters of the male genitalia, particularly those of the penis." In preparing penes for examination, Dr. Borror removed them from the insects, treated them with cold potassium hydroxide and after studying and drawing them, placed each in a small vial of glycerine and the vial in an envelope with the insect from which the penis was removed.

<sup>60</sup> Graduate School Studies, Contributions in Zoology and Entomology, No. 4, The Ohio State University, 1942, xvi + 286 pp., 41 pls. The following changes in Dr. Borror's key to the species seem desirable:

Page 29, couplets 3 and 3': for "Lateral keel" read "Transverse keel" (compare page 13).

P. 30, couplet 8: transpose "truncate, with distal edge nearly or quite straight" to immediately follow "Genital lobe," and thus make this couplet correspond more exactly to couplet 8'.

P. 30, couplet 9 and p. 42, couplet 68: for "anal edge" read "anal angle."

On reaching couplet 23', page 32, penis "with a more or less distinct posterior lobe," it should be noted that triplet 27' p. 34 (to which 23' leads in some cases), states "Penis with posterior lobe poorly developed and in some cases apparently lacking." A similar case is furnished by the series of couplets 38', 40', 41', 42' and 43'.



In making the present identifications of pinned dry specimens, I have not separated the penes from the insects, for only an infinite series of meticulous curators can assure the continued association of an insect and its detached parts and the possibility of later students examining *all* parts of a specimen. I have, therefore, proceeded as follows, following a suggestion for certain other *Odonata* which I owe to Mrs. Leonora K. Gloyd. A tiny wad of raw cotton wool, soaked in a weak solution of household ammonia, was placed on the ventral surface of the second and third abdominal segments of the inverted, pinned dragonfly and allowed to remain for one, two, or three hours. When convenient, and if the genitalia were still moist, the insect was placed under a binocular dissecting microscope, Greenough model, the penis gently lifted with fine needles, and even fine forceps, so that it was completely protruded but still attached to the abdomen. A small triangle of white paper (white as being conspicuous),  $< 1 \times 2-3$  mm., was then inserted, with the same instruments, between the second and fourth segments of the penis and the insect laid aside to dry. The penis thus remains visible and distinct from neighboring parts. This method is more expeditious than Dr. Borror's.

It is not pretended that penes treated by this method show all the details revealed in Dr. Borror's figures of penes prepared with potassium hydroxide and *kept moist*. This is especially true for the details of the internal and posterior lobes of the penis. It is believed, however, that sufficient detail is preserved in the penes, as here treated, to permit safe identification, leaving the finer details for comparative anatomical studies and the potassium hydroxide or similar techniques.<sup>61</sup>

To what extent the penes, as here prepared, fall short of Dr. Borror's figures, may be seen by comparing our figures with his for the same species.

***Erythrodiplax castanea* (Burmeister, 1839).**

(Plate II, fig. 23).

Kartabo, V.4.1926, one male, abdomen lost; V.11.1924, one male; 7.VII.1922, one female, No. 56. Abary<sup>62</sup> [River, near the coast]; 2.V.1924, one male.

The males have the brownish-yellow spot on the base of the front wings larger (reaching to the cubital cross-vein) than in the female (only half-way to that vein). The first and third males listed have two cubital

cross-veins on the hind wings, the other male and the female have only one. The female has 4 cells in the subtriangle of the left front wing.

Distribution: Trinidad and Colombia to S. Paulo, Brazil, Paraguay and central Peru.

***Erythrodiplax angustipennis* Borror, 1942.**

(Plate II, fig. 24).

Borror, 1942, Revis. *Erythrod.*: 68, figs.

French Guiana: 100 (?) mi(les) up Maroni River (Dr. Wm. Schaus), one male (U. S. Nat. Mus.).

This male belongs to the *longitudinalis* group of Borror, pp. 64-65. It agrees with *E. anatoidea* Borror, 1942, in having the frons metallic bluish-dark reddish brown<sup>63</sup> anteriorly and dorsally, where it is coarsely punctate-rugose, sides glabrous and almost blackish, except for a small, triangular, yellow spot at each latero-ventral angle; thorax with no yellow lateral stripe; abdominal appendages nearest to brown pink (No. 21) of Smith's glossary.

It agrees better with Borror's figures of the genital hamule, genital lobe and penis of *angustipennis* than with those for *anatoidea* or *longitudinalis*.

Thorax blackish dorsally, indian red (Smith No. 33) on the sides. Abdomen cologne earth (Smith No. 37) to blackish, an indistinct brown ochre longitudinal streak on each side of dorsum of segments 4-7, no pruinescence. The venation and dimensions fall within the ranges given for *angustipennis*.

Of the three species of this group, Dr. Borror saw one male (Bejuma, Venezuela) of *longitudinalis* (Ris), one male, one female (Porto Velho, Brazil) of *anatoidea* Borror and three males, two females (Cachuela Esperanza,<sup>64</sup> Bolivia, and Villa Murinho, Brazil) of *angustipennis* Borror, while a male of the last named from "Alcobaza, R. Totantias" (Alcobaca, Rio Tocantins?) is quoted, page 70, from Ris. No other definite localities for these three species have been published; much is still to be learned concerning them.

Distribution of *angustipennis*: French Guiana, tributaries of the Amazon in Brazil and Bolivia as stated above.

***Erythrodiplax unimaculata* (De Geer, 1773).**

(Plate II, figs. 25, 26).

Kartabo, VRS Odon. 2, 29, 62, three males; Odon. 33, one female, front wings lost; LAMA 17, one female; VRS Odon. 18, 113, two males; Georgetown, one male.

French Guiana: Cayenne, Jan. 04 (Wm. Schaus) one mature male (U. S. Nat. Mus.).

<sup>61</sup> Both Dr. Borror and I will, I fear, fall under the censure of Dr. G. Fankhauser, who writes: "One of the characteristics that should be included in the description of every species of plant or animal is the number of chromosomes that are to be found in its cells." *Quart. Rev. Biol.*, 20 (1):20, March, 1945.

<sup>62</sup> See M. B. & C. W. Beebe, *Our Search for a Wilderness*, New York, 1910, map, p. 110.

<sup>63</sup> Dragon's blood 34, or burnt sienna 35, of Plate IV of Smith's *Explanation of Terms* used in Entomology, from which other color terms are here taken.

<sup>64</sup> Probably Cachuela Esperanza of the National Geographic Society's map of South America of 1942.

The first three males above listed are immature, wing spots yellowish-brown, thorax and abdomen marked with yellow; the second three males are mature, thorax, abdomen and basal wing spots dark brown to black. The LAMA 17 female has the vulvar lamina in caudal view a little more widely rounded than that of No. 33 and may be *laurentia* in view of Dr. Borror's remarks on pages 40 and 85.

The penes of the two males treated with ammonia are not as much expanded as in Dr. Borror's figure 97, ventral view, but all seven males agree with the other characters of this species. These two penes have more the appearance shown in his figure 116, ventral view, of *latimaculata*, but the lateral view of the terminal joint is not at all like that of *latimaculata*. The lateral view of what I here identify as *unimaculata* differs from Dr. Borror's figure 97 in having the apical lobe less projecting, much as in his figures of *fervida* and *ochracea*, 95 and 96, but even the teneral male No. 62 has some bluish reflection on frons and vertex. His figures 227 and 237 are referred on his page 252 to *unimaculata* and both are stated to be of the same specimen, "No. 116b, Georgetown, British Guiana, Oct. 10-15, 1920." On page 63, figure 227 is referred to *E. venusta*.

Distribution: Jamaica, Martinique and Trinidad, Guiana to Matto Grosso, Brazil, Paraguay and central Peru.

***Erythrodiplax laurentia* Borror, 1942.**

(Plate II, fig. 27).

Borror, 1942, Revis. Erythrod., 83, figs.

Kartabo, 21.V.1924, one male, abd. segs. 6-10 lost, genitalia of 2 obscured by gum; 6.VI.1924, one male; VI.11.1924, two males.

The male of 6.VI. agrees with *laurentia* in Dr. Borror's key, page 31, wing spot, fig. 22, appendages, fig. 190, hind prothoracic lobe, fig. 371, and profile of frons, fig. 335, but is more like *kimminsi* in penis, fig. 100, lateral view, hamule and genital lobe, fig. 242, and in size, abdomen 21, hind wing 26 mm.; the internal lobes of the terminal segment of the penis are not dilated in this ammonia-treated male. The two males of VI.11 agree with *laurentia* in wing spot, appendages, hind prothoracic lobe as far as visible and in size, abdomen 20, 21 mm., hind wing 23, 24.5 mm.; one of them is like fig. 241 of the hamule and genital lobe of *laurentia*, but is a little more like *kimminsi* in the profile of the frons, fig. 333; its penis is not protruded; the other of these two males has the profile of the frons as shown for *laurentia*, but is more like *kimminsi* in hamule and genital lobe and in the lateral view of the penis, the internal lobes of the terminal segment of the penis not dilated.

Distribution: Guiana to Para, Brazil.

***Erythrodiplax famula famula* (Erichson, 1848).**

(Plate II, figs. 28, 29).

Kartabo, ten males, five females, some dated from III.9.(1926) to VI.1.(1924), and 27 and 29.X.1920, the male with the last date No. 20773, others numbered Odon. 49 (one male), VrS Odon. 50 (one female), Odon. 54 (one male, Kalacoon 1916), Odon. 109 (one male), Odon. 121 (one female).

In all of these males the basal yellow or brown spot fills only part of the triangle on the hind wings.

Distribution: Cuba, Trinidad, Venezuela, the Guianas to Minas Geraes, Brazil.

***Erythrodiplax latimaculata* Ris, 1911.**

(Plate II, figs. 30, 31).

Kartabo, one immature male, with labels Odon. 38, LAMA 17.

This male is apparently *latimaculata* by its characteristic penis (Borror, fig. 116), genitalia of the second abdominal segment (B., fig. 250) and hind lobe of the prothorax (B., fig. 374), but is very small: abdomen 15 mm., hind wing 18 mm., stigma of the front wing 2.22 mm. Basal spot of wings brownish-yellow, on the front wings to the second antenodal for the entire width of the wing, on the hind wings to the fourth antenodal, apex of triangle and to the hind margin 1-2 cells proximal of the apex of the anal loop. Venational details within the ranges given by Dr. Borror for this species.

Neither Ris nor Dr. Borror describe immature males of this species. The differences in coloration are considerable as the following show: Vertex brown with a transverse darker line connecting the lateral ocelli, frons red without blue or purple reflections (frons and vertex of the shape and punctuation as in an adult male from Pirassununga, S. Paulo, Brazil); clypeus, labrum and labium reddish-yellow without dark markings; thorax brown above, pale greenish on the sides; abdomen pale brown, an ill-marked, narrow, darker, mid-dorsal stripe or line on 3-10, appendages pale brown, legs pale brown. Similar teneral males, distorted after removal from alcohol, are in the lot from Pirassununga.

Distribution: Venezuela, Bolivia (Santa Cruz), British Guiana, Brazil (Amazonas, Minas Geraes, S. Paulo).

***Erythrodiplax umbrata* (Linnaeus, 1758).**

Kartabo, twelve males, six females, some dated from III.9.(1926) to August (1920, 1926, Dr. C. Hodge IV), some numbered Odon. 73 (one male), VrS Odon. 125 (one male), Odon. 61 (one female), LAMA 17 Odon. 3 and 64 (two females), Odon. 31 (one male). Georgetown, one male, one female. Essequibo River below [between?] mouths of Potaro and Rupinuni, V.1920



(Geo. B. Fox), one female (Acad. Nat. Sci. Phila.).

Two males from Kartabo, 11.VI.1924 and July-Aug., 1926, are teneral. All eight females are heterochrome, i.e., lack the broad dark band on the wings between nodus and stigma.

Distribution: Indiana and Ohio (U.S.A.) to Argentina (Santa Fe and Buenos Aires) and central Peru and Bolivia (Santa Cruz), including the West Indies but not Chile.

***Erythrodiplax maculosa* (Hagen, 1861).**

(Plate II, figs. 32-34).

Ris, 1911, Cat. Coll. Zool. Selys-Longch., fasc. XII:526, fig. 316.

Borrer, 1942, Revis. Erythrod., 119 (with bibliography and synonymy).

Dias dos Santos, 1945, *Ann. Ent. Soc. Amer.*, 37 (4):389-392, pl. I.

Borrer, 1945, *Ann. Ent. Soc. Amer.*, 37 (4):393-395, figs.

Kartabo, one male, abd. segs. 6-10 lost, labeled LAMA 17 Odon. 63.

This male agrees in many respects with the recently (1945) published descriptions and figures by Senhr. Dias dos Santos and Dr. Borrer, but also shows the following differences: occiput black above, yellow behind, basal spot on front wings confined to the cubital and anal spaces but not reaching the first anal cross-vein or its level in the cubital space; basal spot on hind wings darkest in the subcostal and cubital areas and triangle (nearest to the brown ochre of Smith's glossary, pl. IV, No. 36, but darker), remainder of the spot paler, fading out at the fifth antenodal and at two cells beyond the triangle, anal area behind A not as markedly paler than the rest of the spot as shown in Dr. Borrer's (1945) figure 3; front wings with 6(\*)<sup>65</sup> antenodals, the last continued to R1, costal side of triangle broken so that the distal piece is slightly longer(\*) than (right) or equal(\*) to (left) the proximal piece; hind wings with 4(\*) postnodals, base of the triangle a little distal of the arculus, only 1 cell between the bases of A2 and Cu2; size smaller(\*): hind wing 13 mm. vs. 16-17.5 mm.; fewer cells between Rs and Rspl: 6(\*) (front wings), 5(\*) (right hind wing), 4(\*) (left hind wing), symptomatic of other details in the distal half of the wings and perhaps correlated with their smaller size. The variation in the origin of the nodal sector, M2, in this male is shown in our figure 34; its condition in the left front and right hind wings is to be considered normal, in the other two wings abnormal (compare Dr. Borrer's 1945 figure 3).

It is of interest to note the points of resemblance between this male and the male

type of *Edonis helena* Needham (1905)<sup>66</sup>: the black lips, all triangles and the subtriangle free, the non-development of Mspl, 1 cubital cross-vein, the brown basal, although much smaller, spots on the wings, the 6 antenodals on the front wings, all continued to R1, the venation of the area between A3 and the hind wing margin, and only 1 cell between the bases of A2 and Cu2. There are, of course, many differences, *Edonis* having 2 bridge cross-veins, the costal side of the triangle of the front wings not broken, Rspl more sharply defined, the differently shaped genitalia of the second abdominal segment, without considering all those venational features of *maculosa* for which the latest two authors give variation data.

The single male deters me from attempting a caustic potash-glycerine preparation of its penis, but I have made two drawings of the dried organ for comparison with Snhr. Dias dos Santos' figure 9. The resemblances here, those mentioned above and absence of the appendages from this male, all deter me from regarding it as specifically distinct from *maculosa*.

Distribution of *maculosa*: British Guiana, Minas Geraes and S. Paulo, Brazil, Paraguay; the original locality (Georgia, U.S.A.) reported by Hagen is almost certainly erroneous.

***Erythrodiplax basalis basalis* (Kirby, 1897).**

(Plate II, figs. 35, 36).

Kartabo, one male, abd. segs. 6-10 lost, labeled Kalacoon 1916 Odon. 115, three females, labeled VrS Odon. 21, Odon. 59 and Odon. 90, respectively.

The abdomens of the three females measure 16-16.5 mm., hind wing of the male 17.5, of the females 18.5-19, stigma of the front wings, male 2.13, of the females 2.36-2.64 mm. The front wings have the triangle free in the male and in two females, and once-crossed in female 21; the subtriangle 3-celled except in the right front wing of female 59 where it is 2-celled, two posttriangular rows from the triangle out in the same three, three posttriangular cells, then 2 rows in female 21. The hind wings have Cu1 separating from the triangle a little distad of its hind angle and only 1 cell between that angle and A2 in all four individuals. The arculus is proximal to the second antenodal in all wings except in the left hind of female 21. The basal spot of the wings of the females is yellow, reaching to the cubital cross-vein or less on the front wings, to the arculus or less and to the anal angle on the hind wings.

Distribution: Jamaica, Trinidad, the Guianas, Colombia to Matto Grosso, Brazil, central Peru and Santa Cruz, Bolivia.

<sup>65</sup> Differences marked with a (\*) are also differences from Ris' 1911 description and figure of Hagen's type of *maculosa* in the Zürich Museum.

<sup>66</sup> *Proc. Biol. Soc. Washington*, 18:113.

***Erythrodiplax connata fusca* (Rambur, 1842).**

*Erythrodiplax connata* Burm. e (*fusca* Ramb.) ♂, Calvert, 1906, Biol. Centr.-Amer. Neur., pl. IX, fig. 41 (penis, untreated).

Kartabo, seven males, two females, some dated from 3.5 to VI.15.1924, one male is XI.1920, others are labeled VRS Odon. 13 and 128 (two males), Odon. 120 and VrS Odon. 9 (two females). Essequibo River below [between ?] mouths of Potaro and Rupununi, IV-V.1920 (George B. Fox), two males, one has lost abd. segs. 6-10 (Acad. Nat. Sci. Phila.).

French Guiana: 60 mi(les) up Maroni R(iver), 8.04 (Collection Wm. Schaus), one teneral male in bad condition, abd. segs. 5-10 lost (U. S. Nat. Mus.).

A Kartabo male of 6.VI.1924, has the frons reddish but with a purplish tinge which would incline me to refer it to *E. c. connata*. Dr. Borror, however, refers all British Guiana material of *E. connata* to *E. c. fusca*. It is not *melanorubra* (cf. his Revision, page 163) because of the shortness of the terminal joint of the penis: 1.09 mm.

Distribution: Mexico and Trinidad to southern Peru, Bolivia (Santa Cruz), Argentina (Tucuman) and Uruguay.

***Erythrodiplax melanorubra* Borror, 1942.**

French Guiana: St. Laurent, Moroni River (Collection Wm. Schaus), two females, undated. (U. S. Nat. Mus.).

One female has the vulvar lamina apparently normal, its antero-ventral margin in profile view .95 mm. long, almost equal to the lateral tergal margin of abdominal segment 9; abdomen 16 mm., hind wing 21, costal edge of stigma of front wing 2.74 mm. The second female has the dimensions of the vulvar lamina, abdomen, hind wing and stigma as in the preceding individual, but the ninth segment appears to be retracted slightly into the eighth, so that its visible lateral tergal margin is slightly shorter. The nearest localities to French Guiana, recorded by Dr. Borror for *melanorubra*, are in the states of Aragua, Carabobo and Yaracuy of Venezuela, so that this species should appear in British Guiana also.

Distribution: French Guiana, Venezuela to central Peru, Bolivia (Santa Cruz), Paraguay, Brazil (S. Paulo) and Argentina (Entre Rios).

***Erythemis peruviana* (Rambur, 1842).**

Kartabo, one male, 1.V.1921, one female, 7.VI.1924; LAMA 17 Odon. 92, one male; Abay (Abarý ?, on the coast) Odon. 32, one male; G(eorge)town, one male, abd. segs. 5-10 lost. Male Odon. 32 and the female bear pin labels "*Erythemis peruviana* (Rambur) Cur" presumably in Mr. R. P. Currie's handwriting; male 32 lacks head and abdomen.

Distribution: Tamaulipas, Mexico, to Corrientes, Argentina; Jamaica.

***Erythemis attala* (Selys, 1857).**

Kartabo, 6.5.1924, one female, right hind and left front wings lost.

Distribution: Guadalajara, Mexico, to Buenos Aires; Cuba, Haiti, Martinique.

***Leptthemis vesiculosa* (Fabricius, 1775).**

Kartabo, eight males, four females, some dated from III.7 (1921) to 17.VIII (1920), including two males by Dr. C. Hodge IV (1926), one male numbered Odon. 115, one male labeled LAMA 17 Odon. 129, one female VRS Odon. 119 (?). Most of the specimens have lost some segments of the abdomen.

Distribution: Sanibel Island (Westfall, 1941), Florida and southern Texas to Corrientes, Argentina.

***Rhodopygia cardinalis* (Erichson, 1848).**

Kartabo, two males, terminal abdominal segments lost, one labeled Odon. 28, the other Odon. 110.

Distribution: Guiana to Matto Grosso, Brazil, and eastern Peru (?).

**v. Trithemiinae T. & F., 1940.*****Dythemis multipunctata* Kirby, 1894.**

Ris, 1919, Cat. Coll. Zool. Selys-Longch., fasc. XVI (2):1202, 1206.

Kartabo, 3.VI.1924, one male.

French Guiana: Cayenne, Dec. 03 (Collection Wm. Schaus), one male (U. S. Nat. Mus.).

These identifications are according to Ris' revision of the species of 1919, without further study on my part. These two males agree with his description (p. 1207) of a series of seven males from Tumatumari, British Guiana, 7.12.II, except that there are no pale spots on abdominal segment 7 of the Kartabo male and none on segment 8 of both males. His description of the Guiana examples is comparable with that of six males from Guatemala wherein is stated: "meist ein schwarzes Bogenstreifen über den Postclypeus;" in the Kartabo male the black arched streak is on the lower margin of the postclypeus (nasus).

Distribution: Guatemala and the Guianas to Peru and Buenos Aires; St. Vincent, Grenada and Trinidad in the West Indies.

***Macrothemis polyneura* Ris, 1913.**

Ris, 1913, Cat. Coll. Zool. Selys-Longch., fasc. XV:888; 1919, XVI (2):1214.

Kartabo, VI.17.1924, one female, abd. segs. 6-10 lost.

Ris (1913) described this variable species from one male each from Poco Grande (Estado S. Paulo), and Parana, Brazil, from one female each from Surinam, Jurimaguas



and Jatahy (Goyaz) and from two females from Espirito Santo; in 1919 he added the description of a male from Kaieteur Ravine, British Guiana (11.IV.1912).

The present female differs from the description of the five females as follows: Lips nearest Van Dyke brown of the colors shown on Plate IV of Smith's Explanation of Terms used in Entomology; frons Van Dyke brown with metallic bluish reflection anteriorly and superiorly. The "gelbliche Längsbinden . . . der Dorsalkante genäherte auf Segment 5-7" of the abdomen appear to be present on segment 4 also. Yellow at base of front wings reaching to 2 cells beyond the triangle, at base of hind wings to antepennate antenodal and 4 cells beyond the triangle, paler where it reaches the hind margin of the wing proximal to the anal loop, remainder of all wings faintly brownish. Two cells in the widest part of the anal loop on the distal side of A2 opposite the external angle, but only 1 row of cells on the proximal side of A2, i.e., between A2 and A3; 4 rows of cells between A3 and the anal margin; post-triangular (discoidal) cells on the right hind wing 2 rows from the triangle distad for 5 cells, thence increasing; on the left hind wing they are 1, 2, 1, 1, 2, 2, 2, 3. . . . Antenodals front wings,  $14\frac{1}{2}$ , arculus slightly proximal to the 2nd, hind wings, 11 (right), 10 (left), arculus distal to the 2nd. Abdominal segments 1-5 15 mm., hind wing 32 mm., stigma, front wing 2.13 mm., Cologne earth of Smith's glossary, *loc. cit.*

Distribution: The Guianas to Parana, Brazil, Jurimaguas (Yurimaguas?), Peru.

**Macrothemis pumila** Karsch, 1890.

Karsch, 1890, Berl. Ent. Zeitsch., 33 (2): 364, 368. Ris, 1913, Cat. Coll. Zool. Selys-Longch., fasc. XV:895; 1919, fasc. XVI (2): 1218. Geijskes, 1932, Zool. Meded., 15 (1-2): 125.

Kartabo, two females, both lacking abd. segs. 7-10, one dated 20.X.1920.

Both females agree well with Karsch's original description of this species from Bahia. Ris figured (1913) the appendages and the genitalia of the 2nd abdominal segment of the male and in 1919 described both sexes from British Guiana and Trinidad with figures of their venation. Dr. Geijskes (1932) also has notes on Trinidad examples.

Distribution: Trinidad, British Guiana, Amazon valley from Para to Umbria, Colombia, and Porto Velho on the Rio Madeira, Bahia.

vi. Zygommatinae T. & F., 1940.

**Tholymis citrina** Hagen, 1867.

Kartabo, July-Aug., 1926 (Dr. Charles Hodge IV), one male (Acad. Nat. Sci. Phila.).

Distribution: Vera Cruz, Mexico, to Mi-

nas Geraes and Matto Grosso, Brazil; Cuba, Jamaica.

**Pantala flavescens** (Fabricius, 1798).

Bartenef, 1931, Zool. Jahrb. Abt. Syst. Ökol. Geog. Tiere, 60 (5-6):471-488 (geographical distribution with world map).

Kartabo, four males, V.4.1924 to July-Aug. 1926 (including one by Dr. C. Hodge IV in Acad. Nat. Sci. Phila.).

French Guiana: St. Laurent, Maroni River, M[ar]ch (collection Wm. Schaus), one male (U. S. Nat. Mus.).

Distribution: The most wide-spread of all Odonata: circumtropical, extending northward to North Dakota and Maine, Egypt, Transcaucasia, Turkestan, the Himalayas, Amur region of Siberia and Kamtschatka and southward to Sao Paulo, Natal and New South Wales (Bartenef, 1931).

**Tramea cophysa** Hagen, 1867.

Ris, 1913, Cat. Coll. Zool. Selys-Longch., fasc. XVI (1):988, fig. 570 (genit. male); 1919, fasc. XVI (2):1223.

Referred by implication to *Trapezostigma* Hagen, 1849, by Cowley, 1935, *Entom.*, 68: 283.

Kartabo, 2.V.1921, one male, hind wing 41 mm., abdomen (excl. apps.) 28 mm.

French Guiana: Cayenne, two males 12.03, 2.04, one female Jan. 04 (collection Wm. Schaus, U. S. Nat. Mus.).

The Kartabo male is puzzling, with features agreeing with *cophysa* on the one hand and approaching *onusta* on the other.

Those agreeing with *cophysa* are: Head (if it belongs here, left eye considerably damaged) with vertex and frons metallic violet; thorax with well-marked yellow stripes on mes- and metepimera, reaching more ventrad than the level of the metastigma; (labium discolored); face greenish-yellow along the eyes; thoracic dorsum reddish-brown, no black markings (apices of superior appendages broken off); hamule pressed against the genital lobe so as to be no more prominent than the lobe, its shape like that in Ris' figure 570; wings, other than the basal spots, hyaline, venation somewhat reddish-brown except in the basal spots where it is yellowish; basal spot of front wing yellow half-way to first antenodal; only 1 row of cells between A2 and A3.

Those features approaching *onusta* are: Basal spot of the hind wings brown reaching to: in C and Sc one-half way between 1st and 2nd antenodals, in R and M to arculus, in supratriangle and triangle to level of 2nd antenodal, filling the hindmost cell of the first row of post-triangular cells, the first 2 cells between Cu1 and Cu2, to nearly the same level between Cu2 and A2, behind A3 nearly to the level of the distal angle of the triangle, thence curving slightly

proximad and caudad to the anal angle of the wing; the distal margin of this basal brown spot, therefore, serrate in its anterior half; one row of cells between Cu1 and Cu2; the pale area posterior to the membranule and along the anal margin of the wing occupies a maximum width of 7 cells at right angles to that margin, hence far from A3. This present specimen has the most extensive basal spot on the hind wings for any *cophysa* yet described.

Ris (1913) recognized three forms of *cophysa*: (a) with the basal spot of the hind wing "relativ gross von reichem gold braun, gelb geädert und meist mit breitem gelbem Hof"; (b) with the basal spot "sehr klein" or (c) "klein." This Kartabo male falls in his form (a).

As to the three examples from Cayenne, although the lateral, yellow, thoracic stripes, if present, have faded, I believe them also to be *cophysa* form (a); otherwise they agree fairly closely with Ris' description. The lengths of the superior appendages, of segments 9 + 10, and of segments 8 + 9 + 10 (measured along the mid-dorsal line) of these three specimens are, respectively, 3.19, 2.21, 4.90; 3.52, 2.62, 4.91; 2.69, 2.54, 4.66 mm. The genital hamules do not project quite as far beyond the genital lobe as shown in his figure 570 from a male from Guayaquil. The dark brown basal spot of the hind wings extends to the cubital cross-vein or to the origin of A2 (males), or half-way between the origins of A2 and Cu2 (female).

Distribution of form (a): Tennessee and Texas (Williamson, 1914), and from Ocotlan, Mexico, and Cuba to Guayaquil, Ecuador, and Santos, Brazil.

*Idiataphe longipes* (Hagen, 1861).

Cowley, 1934, *Ent. Mo. Mag.*, 70 : 243 (*Ephidatia* preoccupied).

*Ephidatia longipes* Calvert, 1906, *Biol. Centr.-Amer. Neur.* 216, tab. ix, figs. 1-5. Ris, 1913, *Cat. Coll. Zool. Selys-Longch.*, fasc. XVI (1) : 1013. Klots, 1932, *New York Acad. Sci. Surv. Porto Rico, etc.*, XIV (1), pl. II, fig. 16 (genit. male).

*Ephidatia longipes longipes* Ris, 1913, op. cit. : 1014 and 1919, fasc. XVI (2) : 1227.

*Ephidatia longipes cubensis* Ris, 1913, 1919, op. cit. : 1013, 1226.

*Ephidatia cubensis* Needham & Fisher, 1936, *Trans. Amer. Ent. Soc.*, 62 : 108 (nymph), figs.

*Idiataphe cubensis* Garcia-Diaz, 1938, *Journ. Agr. Univ. Puerto Rico*, 22 (1) : 60, pl. VII, fig. 3 (venation).

LAMA 17, Odon. 1 and 60, two males.

Both males have lost abdominal segments 5-10, both have the outer branch of the genital hamule "breit, fast quadratisch," one of the characters by which Ris (1913, p.

1012) distinguished *longipes* from *batesi*. This quadrate form is shown by Calvert (1905, fig. 4) and by Mrs. Klots (1932). Ris further gave 7½-8½ antenodals on the front wings for *longipes*, 6½ for *batesi*. Both of these males have 6½ antenodals; they show a faded pale (yellowish?) stripe on the ventral inflexed part and, more narrowly, on the adjacent dorsal part of the tergite of the third abdominal segment only, this stripe reaching from the anterior end to three-fourths' length of the tergite; basal brown spot of the hind wings reaches in Sc half-way to the first antenodal and in Cu to the origin of A2; labium yellowish-brown in distal half, almost black in the proximal half; labrum black, clypeus nearest Van Dyke brown of plate IV, No. 39, of Smith's glossary; vertex almost black, frons very dark metallic violet blue, thorax blackish, no pale markings visible (faded?); hind wing 27, 28 mm.

These two males, therefore, do not agree completely with either of the two subspecies of *longipes*, *longipes longipes* and *longipes cubensis*, recognized by Ris.

Distribution of *longipes longipes*: British Guiana; Para (?), Minas Geraes, Espiritu Santo, S. Joao del Rey (Rei) and Rio de Janeiro, Brazil. (Ris). Kirby adds Colombia (*Trans. Zool. Soc. Lond.*, 12 (9) : 331. 1889).

Distribution of *longipes cubensis*: Bahamas, Cuba, Isle of Pines, Puerto Rico, Trinidad, Mexico, Guatemala, Panama, Colombia; Santarem, Brazil (Ris, 1913, 1919; Needham & Fisher, 1936; Garcia-Diaz, 1938).

It is of interest to note that Ris, 1919, p. 1227, records both *E. longipes longipes* and *E. batesi* from Wismar, British Guiana, as taken on the same days, 15, 16.II.1912, by the same collectors, Williamson and Rainey.

ADDENDUM:

*Dicterias cothurnata* (Foerster) new combination.

*Neocharis cothurnata* Foerster, 1906, *Jahresber. Mannheim. Ver. Naturk.*, 71-72 : 68. Ris, 1918, *Arch. Naturgesch.*, 82 A (9) : 12. Munz, 1919, *Mem. Amer. Ent. Soc.*, 3 : 47, 73, pl. VI, fig. 31 (venation ♂).

*Charitopteryx cothurnata* Cowley, 1934, *Entom.*, 67 : 201.

Subsequent to the proof-reading of this paper, a single female of this species was found among a miscellaneous lot of unstudied Odonata at the Academy of Natural Sciences of Philadelphia, wherefore the following for completeness' sake.

Bartica, British Guiana, 12.17.1913, H. S. Parish, 1♀; allotype, A.N.S.P.

Distribution: Surinam, British Guiana.

Until the specific characters of forms referred to *Dicterias* are better known, *D. cothurnata* is to be added at the top of list *a* on preceding page 49 of this paper, "Dis-



tribution of the Kartabo Odonata." *Dieterias* is placed in the Calopteryginae by deSelys and Hagen, 1853, in the family Heliocharitidae by Tillyard and Fraser, 1939.

The present female (this sex has not been described hitherto) differs from Foerster's description and Munz's figure of the venation of *cothurnata* male as follows:

Arculus nearest and proximal to the third costal antenodal on the right front wing, midway between the 2nd and 3rd on the left front wing, slightly distal to the 2nd on both hind wings. One double cell between Cu2 and the hind wing margin at less than half distance from the quadrilateral to the distal end of Cu2 on both hind wings; 21 right, 22 left costal antenodals on the front wings, 16 right, 17 left on the hind wings; antenodal length 14 mm., postnodal length 20 mm. on the hind wings, apices of the front wings beyond the stigmata destroyed. Two basal subcostal cross-veins on both front wings and the left hind, one on the right hind. The single cubital cross-vein nearly as far proximal of the arculus as the arculus is long on all the wings, separation of vein A from the hind margin of all the wings as far proximal of the cubital cross-vein as the arculus is long. Nodal sector (M2) separating from M1  $\frac{1}{2}$ -1 $\frac{1}{2}$  cells beyond the nodus, M1a at 6 $\frac{1}{2}$ -8 $\frac{1}{2}$  cells beyond the nodus on the front wings, at 6 $\frac{1}{2}$ -7 cells on the hind wings, and 6 cells beyond the origin of M2 on the front wings and the right hind, 5 cells on the left hind.\* Supplementary sectors as in Munz's figure, rather than in Foerster's lines 26-29, page 68. Postnodals, front wings, 22 right, left broken; hind wings 17 right, 18 left.

Abdominal appendages 1.14 mm. long, subequal to abdominal segment 10, straight, simple, tapering to a very acute apex. Distal half of ventral margin of genital valves serrulate. Palps of genital valves .74 mm. long, cylindrical, divergent in dorsal or ventral view, but curved slightly mesad in terminal fourth, extreme apex slightly thickened, reaching to beyond the level of abdominal segment 10 but not as far as that of the apex of the abdominal appendages.

Third femur 11 mm., 3rd tibia 15 mm., 3rd tarsus 2 mm. Abdomen 39, hind wing 34 mm.

Pterostigma of the front wings total

length 5.32 mm., costal margin 4.74 mm., brown, a brace vein present on the front wings and the left hind, but not on the right hind, not thicker than adjacent cross-veins and not continued in the same oblique line as the proximal side of the stigma. Apex of the wings hyaline, not brown.

No distinct pale band across the ocelli.

Pterothorax olive with the mid-dorsal carina black and reddish-brown (Van Dyke brown of Smith's Glossary) stripes ca. .57 mm. wide on the mesepisternum, humeral (mesopleural) suture and on the metepimeron and ca. .4 mm. wide on the mesepimeron and the 2nd lateral (metapleural) suture; the two sutures named are each finely lined with yellow.

Abdomen olive green, segments 2-8 (or -10?) with an inferior longitudinal Van Dyke brown stripe for the entire length.

Legs reddish-brown.

This female is of nearly the same size as those of *D. umbra* Ris, 1918,<sup>†</sup> of *D. peruviana* Navas, 1920,<sup>‡</sup> and perhaps of *D. procera* Hagen, 1859,<sup>§</sup> (dimensions not given), but larger than that of *D. atrosanguinea* Selys, 1853.<sup>¶</sup>

*Cothurnata* differs from all these four species in having two cross-veins in the quadrilateral of all four wings; this is the second of two characters given by Munz as separating *Neocharis* from *Dieterias*; the first is negated by *D. umbra*.

The position of the arculus with respect to the antenodals, the number of basal subcostal cross-veins (i.e., proximal to the first thickened antenodal), the extent to which M1+3 approximate R, the point of separation of M1+2 from M3, the point of separation of M2 from M1, the exact position of cu c-v and of the point of separation of A from the hind margin of the wings are features which vary even in specimens referred to the same species, so that it is impossible, in the present paucity of material of *Dieterias* recorded in the literature, to determine how many of these venational details have specific significance.

<sup>†</sup> Arch. Naturgesch., 82 A (9):12, pl. 1, figs. 1, 2 (venation ♂, ♀).

<sup>‡</sup> An. Soc. Cient. Argent., 90:34; Cowley, 1937, Proc. Roy. Ent. Soc. London, (A) 12 (8-9): 24, fig. 2 (1st leg.).

<sup>§</sup> Hagen in Selys, Bull. Acad. Belg., (2) 7:444; Needham, 1933, Amer. Mus. Novitat., 664:4, fig. 2 (venation).

<sup>¶</sup> Syn Calopt. :56; Monog. Calopt. :191, pl. 5, fig. 6 (venation), pl. 8, fig. 12 (mouth parts), pl. 14, fig. 6 (abd. apex), 1854; Bull. Acad. Belg., (2) 37:662, 1869. Munz, 1919, Mem. Amer. Ent. Soc., 3, pl. VI, fig. 32, has copied the figure of the venation of the Monog. Calopt.

\* Lines 21-23, page 68, of Foerster's description should apparently read: "Der Sektor subnodalis entspringt 10 Zellängen nach dem Arculus, der Nodalsektor 1 Zelle und der Ultranolal 7 Zellen nach dem Niveau des verdickten Nodus."

## EXPLANATION OF THE PLATES.

Abbreviations on some of the figures:

al, anterior lamina

gl, genital lobe

gs, glans of penis

h, hamule

hl, first (anterior) hamule

h2, second (posterior) hamule

p1-p4, first (vesicle) to fourth joints of penis

pr, hind lobe of prothorax

sh, sheath of penis

A1, A2, A3, C, M1, M1a, M2, M3, R1, Rs, veins according to the Comstock-Needham notation.

Most of the drawings have been made with the aid of a Zeiss camera lucida, the majority in connection with a Zeiss-Greenough binocular microscope using paired oculars 2 or 10, paired objectives F55 or a<sub>6</sub>. Drawings of the penes of *Erythrodiplax* and figures 1, 2, 20, 21 and 22 have been made under a Leitz compound microscope, ocular 10X, objective 3 with its lower lens off for the camera lucida, adding this lens to complete the details by free hand.

## PLATE I.

- Fig. 1. *Leptagrion beebeanum* n. sp. Dorsal view of abdominal segment 10 and appendages of ♂ type, Kartabo, British Guiana, 6.24.1924.
- Fig. 2. *Leptagrion beebeanum* n. sp. Right profile view of the same.
- Fig. 3. *Hetaerina dominula* Hagen. Left superior appendage ♂ Bejuma, Venezuela, February 13, 1920. t indicates the small tooth on the internal superior margin, referred to in the text as being a distinguishing character of *dominula* according to de Selys and Hagen.
- Fig. 4. *Hetaerina dominula* Hagen. The same from Tumatumari, British Guiana, February 11, 1912.
- Fig. 5. *Hetaerina dominula* Hagen. The same from Maroni River, French Guiana, 8.04.
- Fig. 6. *Hetaerina dominula* Hagen. Outline of head ♂ to show the occipital tubercles, Kartabo, 22.X.1920.
- Fig. 7. *Phyllocycla bartica* n. sp. Left profile view of abdominal segments 8-10 and appendages, ♂, holotype, Kartabo, III.9.1926.
- Fig. 8. *Phyllocycla bartica* n. sp. Left profile view of genitalia of second abdominal segment ♂ holotype. One cornu is directed cephalad for clearness' sake. At a is shown a piece of a cornu of the penis more highly magnified.
- Fig. 9. *Phyllocycla bartica* n. sp. Rear view of vesicle (first joint) of penis, ♂ holotype.
- Fig. 10. *Phyllocycla bartica* n. sp. Ventral view of hamules and anterior lamina, ♂ holotype.

- Fig. 11. *Phyllocycla bartica* n. sp. Dorsal view of tenth abdominal segment and appendages, ♂ holotype.
- Fig. 12. *Phyllocycla bartica* n. sp. Right hind wing base, ♀, Kartabo, III.11.1926.
- Fig. 13. *Phyllocycla bartica* n. sp. Right hind wing base, ♂ holotype.
- Fig. 14. *Phyllocycla bartica* n. sp. Ventral view of vulvar lamina and ninth abdominal segment, ♀ Kartabo, III.4.1926.
- Fig. 15. *Phyllocycla bartica* ? n. sp. The same, ♀ Kartabo, July-August, 1926.
- Fig. 16. *Aphylla alia* n. sp. Left profile view of genitalia of second abdominal segment, ♂ holotype, Kartabo, 19.VII.1920.
- Fig. 17. *Aphylla alia* n. sp. Ventral view of hamules, ♂ holotype.
- Fig. 18. *Aphylla alia* n. sp. Right hind wing base, ♂ holotype.
- Fig. 19. *Aphylla alia* n. sp. Rear view of vesicle (first joint) of penis, ♂ holotype.
- Fig. 20. *Metaleptobasis tetragena* n. sp. Dorsal view of mesothoracic horns and hind lobe of prothorax, ♀ holotype, Kartabo, July-August, 1926.
- Fig. 21. *Metaleptobasis tetragena* n. sp. Frontal view of same, ♀ holotype.
- Fig. 22. *Metaleptobasis tetragena* n. sp. Left profile view showing left mesothoracic horn and left tubercle of hind lobe of prothorax, ♀ holotype.

## PLATE II.

- Fig. 23. *Erythrodiplax castanea* (Burmeister). Right profile (lateral) view of last joint of penis, Kartabo, 2.V.1924.
- Fig. 24. *Erythrodiplax angustipennis* Borrer. Right profile view of last joint of penis, Maroni River.
- Fig. 25. *Erythrodiplax unimaculata* (De Geer). Right profile view of last joint of penis, Kartabo, VRS. Odon. 62.
- Fig. 26. *Erythrodiplax unimaculata* (De Geer). Ventral view of apex of last joint of penis, Kartabo, VRS. Odon. 18.
- Fig. 27. *Erythrodiplax laurentia* Borrer. Right profile view of last joint of penis, Kartabo, 6.VI.1924.
- Fig. 28. *Erythrodiplax famula famula* (Erichson). Ventral view of apex of last joint of penis, Kartabo, 20.IV.1920, not fully colored.
- Fig. 29. *Erythrodiplax famula famula* (Erichson). Right profile view of last joint of penis, Kartabo, 1.VI.1924.
- Fig. 30. *Erythrodiplax latimaculata* Ris. Ventral view of apex of last joint of penis, LAMA, Odon. 38.
- Fig. 31. *Erythrodiplax latimaculata* Ris. Right profile view of last joint of penis of same.



- Fig. 32. *Erythrodiplax maculosa* (Hagen). Ventral view of apex of last joint of penis, LAMA 17, Odon. 63.
- Fig. 33. *Erythrodiplax maculosa* (Hagen). Right profile view of genitalia of second abdominal segment of same.
- Fig. 34. *Erythrodiplax maculosa* (Hagen). Nodal region of the four wings of same.
- Fig. 35. *Erythrodiplax basalis basalis* (Kirby). Ventral view of last joint of penis, Kalacoon, 1916, Odon. 112.
- Fig. 36. *Erythrodiplax basalis basalis* (Kirby). Right profile view of last joint of penis of same.
- Fig. 37. *Oligoclada raineyi* Ris. Ventral view of vulvar lamina and abdominal segment 9, Kartabo, 20.V.1924.
- Fig. 38. *Microstigma maculatum* Hagen. Apex of right front wing, Essequibo ♂, type of Hagen, in the Museum of Comparative Zoology; from camera lucida drawing by Prof. B. Elwood Montgomery.
- Fig. 39. *Aeschnosoma peruviana* Cowley. Rear view of vesicle (first joint) of penis, Kartabo. 13.iii.
- Fig. 40. *Aeschnosoma peruviana* Cowley. Left profile view of genitalia of second abdominal segment of same male.
- Fig. 41. *Aeschnosoma peruviana* Cowley. Ventral view of hamules and genital lobes of same male.
- Fig. 42. *Zenithoptera fasciata* (Linnaeus). Photographic reproduction, by Mr. A. D. Warden, of George Edwards' figure, pl. 174, of his Natural History of Birds, quoted by Linnaeus as the basis for his *Libellula fasciata* and also *Libellula americana*.
- Fig. 43. *Aeschnosoma peruviana* Cowley. Photograph, by Mr. Herman A. Walters, of male from Kartabo, 13.iii.

#### Corrections to Plates.

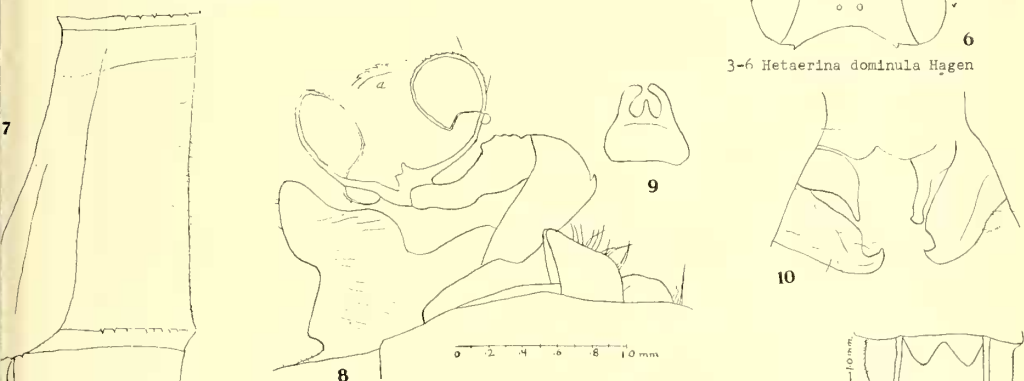
Plate I, Fig. 16. For h2 read h1; for h1 read h2.

Plate II, Fig. 38. Following are the abbreviations marking the wing-veins from above downward: C, R1, M1, M1a, M2, Rs, M3.



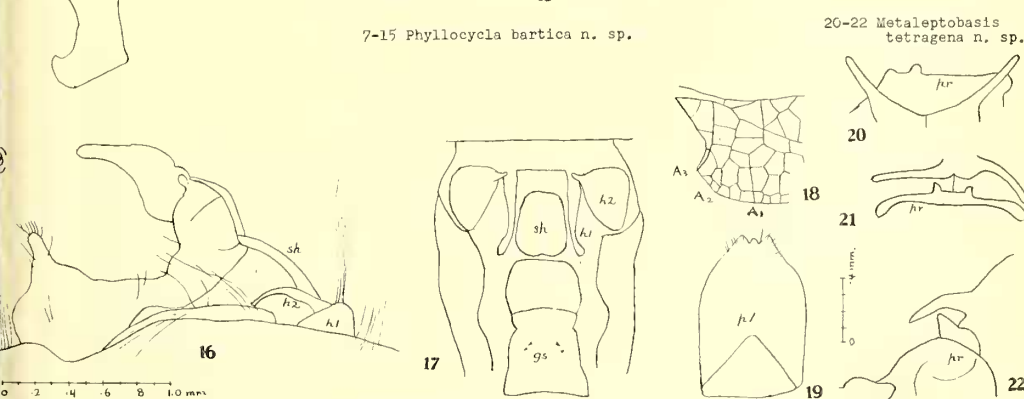
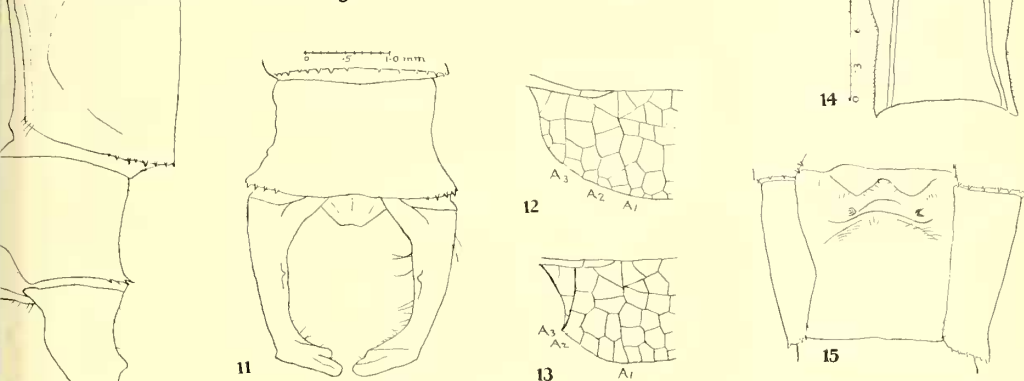
1, 2 *Leptagrion beebeanum* n. sp.

3-6 *Hetaerina dominula* Hagen



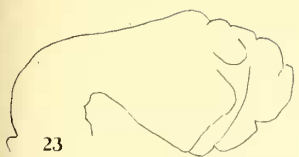
7-15 *Phyllocycla bartica* n. sp.

20-22 *Metaleptobasis tetragena* n. sp.



16-19 *Aphylla alia* n. sp.





23 *Erythrodiplax castanea* (Burm.)



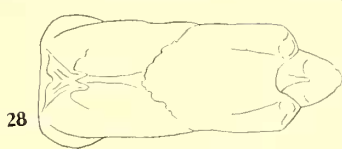
24 *E. angustipennis* Bor.



25, 26 *E. unimaculata* (DeGreer)



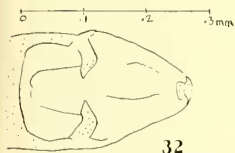
27 *E. laurentia* Borror



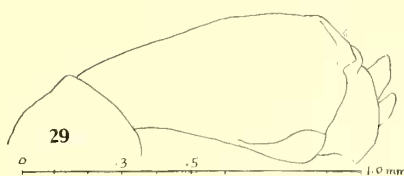
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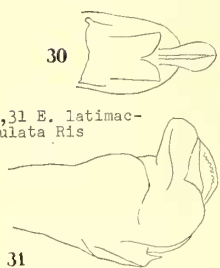
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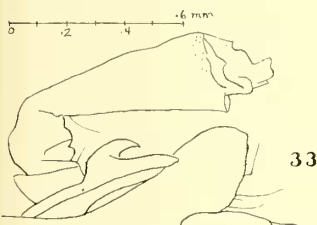
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28, 29 *E. famula*  
*famula* (Erichson)

30, 31 *E. latimaculata* Ris

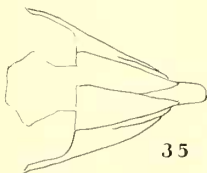


31



33

35, 36 *E. basalis*  
*basalis* (Kirby)

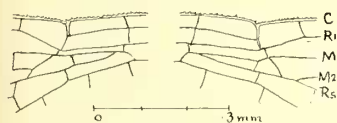


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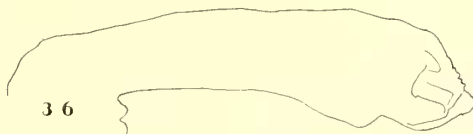
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*Oligoclada*  
*raineyi* Ris



34

32-34 *E. maculosa* (Hagen)

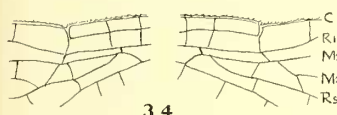


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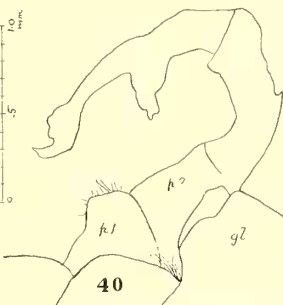


38

38 *Microstigma maculatum* Hagen

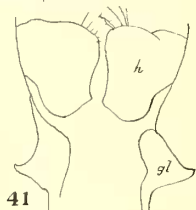


39



40

39-41 *Aeschnosoma peruviana* Cowley



41



42 *Zenithoptera fasciata*  
(Linnaeus)



43 *Aeschnosoma peruviana* Cowley